United States Court of Appeals

for the Second Circuit

APPENDIX

76-7041

UNITED STATES COURT OF APPEALS
FOR THE SECOND CIRCUIT

B

Appeal No. 76-7041

GEORGE LERNER and
JULIUS ELLMAN,

Plaintiffs-Appellants,

-against-

CHILD GUIDANCE PRODUCTS, INC. and
QUESTOR CORPORATION,

Defendants-Appellees.

Appeal From the United States District Court
For the Southern District of New York

Honorable William C. Conner, District Judge

PLAINTIFFS-APPELLANTS' APPENDIX

VOLUME I

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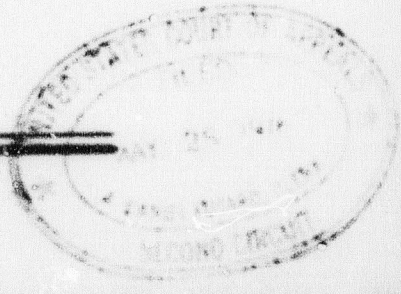

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SUMMONS IN A CIVIL ACTION — D. C. Form No. 45 Rev. (6-49)

United States District Court

FOR THE

SOUTHERN DISTRICT OF NEW YORK

73 CIV. 2006

CIVIL ACTION FILE NO.....

GEORGE LERNER,
JULIUS ELLMAN,

Plaintiffs,

CHILD GUIDANCE PRODUCTS, INC.,
QUESTOR CORPORATION,

Defendants

SUMMONS

To the above named Defendant : CHILD GUIDANCE PRODUCTS, INC.

You are hereby summoned and required to serve upon

PAUL J. SUTTON

plaintiff's attorney , whose address is:

41 East 42nd Street
New York, N.Y. 10017

an answer to the complaint which is herewith served upon you, within 20 days after service of this summons upon you, exclusive of the day of service. If you fail to do so, judgement by default will be taken against you for the relief demanded in the complaint.

THOMAS J. KAVANAGH
Clerk of Court.
E. A. Horton
Deputy Clerk.

Date: MAY 4 1973

[Seal of Court]

Note.—This summons is issued pursuant to Rule 4 of the Federal Rules of Civil Procedure.

SUMMONS IN A CIVIL ACTION

CIV. 1 (2-64)
(Formerly D. C. Form No. 45 Rev. (6-63))

United States District Court

FOR THE

SOUTHERN DISTRICT OF NEW YORK

JUDGE ...

73 CIV. 2006

CIVIL ACTION FILE NO.....

GEORGE LERNER,
JULIUS ELLMAN,

Plaintiffs,

v.

CHILD GUIDANCE PRODUCTS, INC.,
QUESTOR CORPORATION,

Defendants

SUMMONS

To the above named Defendant : QUESTOR CORPORATION

You are hereby summoned and required to serve upon

PAUL J. SUTTON

plaintiff's attorney , whose address is:

41 East 42nd Street
New York, N.Y. 10017

an answer to the complaint which is herewith served upon you, within 20 days after service of this summons upon you, exclusive of the day of service. If you fail to do so, judgement by default will be taken against you for the relief demanded in the complaint.

THOMAS E. ANDREWS, Jr.
Clerk of Court.

E. G. B.
Deputy Clerk.

Date: 1973

(Seal of Court)

Note:—This summons is issued pursuant to Rule 4 of the Federal Rules of Civil Procedure.

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UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

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73 CIV. 2006

GEORGE LERNER,
JULIUS ELLMAN,

Plaintiffs,

v.

73 Civil Action
No.

CHILD GUIDANCE PRODUCTS, INC.
QUESTER CORPORATION,

Defendants.

----------x

COMPLAINT

1. This is an action for patent infringement arising under the Patent Laws of the United States, and more particularly Title 35, United States Code, Sections 271, 281, 283, 284 and 285, as hereinafter more fully appears. Jurisdiction and venue are conferred upon this Court by Title 28, United States Code, Sections 1338, 1391 and 1400.

2. (a) Plaintiff George Lerner is an individual who resides at 12 Prospect Court, Freeport, New York.

(b) Plaintiff Julius Ellman is an individual who resides at 1672 East 7th Street, Brooklyn, New York.

(c) Plaintiffs Lerner and Ellman are each and together actively engaged as professional inventors for the toy industry.

3. (a) Upon information and belief, defendant Child Guidance Products, Inc. is a corporation of the State of New York, having a regular and established place of business at 1055 Bronx River Avenue, Bronx, New York, and elsewhere.

(b) Upon information and belief, defendant Quester

Corporation is a corporation of the State of Ohio, having a regular and established place of business at 1055 Bronx River Avenue, Bronx, New York, in Toledo, Ohio, and elsewhere.

(c) Upon information and belief, defendants Child Guidance Products, Inc. and Questor Corporation are jointly and severally engaged in the manufacture, distribution, and sale of toys and educational products.

4. (a) On February 17, 1959, United States Letters Patent No. 2,873,639 were duly and lawfully issued for an invention entitled "TOY PIANO HAVING KEY MOUNTED TONE BARS", on an application Serial No. 767,081 filed October 20, 1958 in the name of Plaintiff Clair Omar Musser.

(b) On or about August 25, 1972, Plaintiffs Lerner and Ellman duly and lawfully acquired rights, title and an interest in and to said United States Letters Patent No. 2,873,639 from Plaintiff Musser, subject to rights in Plaintiff Musser to receive and share in any and all remuneration received by Plaintiffs Lerner and Ellman in connection with said patent in suit and to participate in and contribute to any infringement actions concerning same, and at all times material hereto plaintiffs have since been and are collectively now the sole owners of said United States Patent No. 2,873,639.

5. (a) On information and belief, defendants, jointly and severally and directly and through their respective agents have infringed the Letters Patent aforesaid during the past six years within the State of New York and elsewhere, and are continuing such infringement, by making, using, offering for sale and selling toys and amusement devices incorporating or made by the use of the patented inventions of said Letters Patent, without license or authority from plaintiffs, and in furtherance of such acts, defendants, jointly and severally and directly and through their respective agents regularly do and solicit business in this

Judicial District, in the State of New York and elsewhere throughout the United States and derive substantial revenues from toys and amusement devices so sold and used.

(b) On information and belief, defendants, jointly and severally, during the past six years within this Judicial District in the State of New York, and elsewhere throughout the United States have directly and through their respective agents induced others to infringe and have aided and abetted others to infringe the Letters Patent here in suit by inducing and causing such others to sell and use toys and amusement devices incorporating or made by the use of the patented inventions of said Letters Patent, without license or authority from plaintiffs, and pursuant to such inducing, aiding and abetting have jointly and severally undertaken to indemnify such others against liability for infringement of said Letters Patent here in suit and against the expenses of defending suit for such infringement.

6. On information and belief and during the last six years, within this Judicial District, the State of New York, and elsewhere throughout the United States, defendants have jointly and severally conspired and joined with one another and with others to infringe the Letters Patent here in suit by arranging to make and sell and causing others to sell and use toys and amusement devices incorporating or made by the use of the patented inventions of said Letters Patent, without license or authority from plaintiffs.

7. Defendants have each been given notice of the infringement and unlawful acts aforesaid, but in disregard of plaintiffs' rights have refused to discontinue and have continued the unlawful acts mentioned above.

8. Upon information and belief, the acts of defendants complained of herein have been committed intentionally, wilfully and with the malicious intent of infringing upon the rights of plaintiffs and of injuring plaintiffs respective businesses

within this Judicial District, in the State of New York, and elsewhere throughout the United States.

9. The aforesaid acts complained of have occurred in this Judicial District and elsewhere throughout the United States, have caused loss and injury to the businesses of plaintiffs in the State of New York and elsewhere, in an amount not presently ascertainable, and threaten to continue and to increase such loss and injury unless enjoined by this Court.

WHEREFORE, plaintiffs each pray for:

A. An injunction, preliminary and permanent, enjoining and restraining each and both of the defendants and the officers, agents and servants of each of them, and all persons under the control of either of them or in privity with either of them, from further infringement of said Letters Patent NO. 2,873,639, and from using or causing to be used, and/or selling or causing to be sold, and/or making or causing to be made, any goods or products embodying or made by any of the inventions covered by the aforesaid Letters Patent, and from contributing to, inducing, aiding, and/or procuring any such infringement or acts.

B. An accounting of defendants' profits and plaintiffs' damages resulting from or due to defendants' infringement and inducing infringement of said Letters Patent.

C. An order requiring defendants to pay to plaintiffs the costs of this action.

D. An order requiring the defendants to pay plaintiffs reasonable attorneys' fees incurred in connection with the claims for relief heretofore stated.

E. Judgment against defendants in the amount of three times plaintiffs' actual damages in accordance with Section 284 of the Patent Act. (35 U.S.C. 284).

F. Such other and further relief as the circumstances of the case may require and to this Honorable Court may seem just and equitable.

PAUL J. SUTTON
41 East 42nd Street
New York, New York 10017
(212) OX 7-5090

Attorney for Plaintiffs

Dated: New York, New York
~~January~~ April 23, 1973
January 24

OF COUNSEL:

Irving M. Getnick, Esq.
116 John Street
New York, New York 10038

GA 155

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

GEORGE LERNER, JULIUS ELLMAN, Plaintiffs,	JUDGE WYATT 73 Civ. 2006
vs.	DEMAND FOR JURY TRIAL
CHILD GUIDANCE PRODUCTS, INC., and QUESTOR CORPORATION, Defendants	

PLEASE TAKE NOTICE, that plaintiffs, George Lerner and Julius Ellman, under the provisions of Rule 38 of the Federal Rules of Civil Procedure, hereby demand trial by jury of the issues raised by the pleadings in the above-captioned litigation.

ORIGINAL SIGNED
BY
PAUL J. SUTTON

Dated: New York, N.Y.,
July 15, 1973

PAUL J. SUTTON
Attorney for Plaintiff
41 East 42nd Street
New York, N.Y. 10017
(212) OX 7-5090

TO:

DONALD R. BAHR, Esq.,
Questor Corporation
P. O. Box 965
Toledo, Ohio 43694

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

GEORGE LERNER, and JULIUS ELLMAN, Plaintiffs, vs. CHILD GUIDANCE PRODUCTS, INC., and QUESTOR CORPORATION, Defendants	JUDGE WYATT 73 Civ. 2006 CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true copy of the foregoing Demand for Jury Trial was served upon the attorney of record for defendants in the above entitled action by depositing a true copy of same in the U.S. mail, first class mail, postage prepaid, to said attorney at his address as disclosed by the pleadings of record herein, on July 15, 1973.

ORIGINAL SIGNED
BY
PAUL J. SUTTON

PAUL J. SUTTON

(3)

BEST COPY AVAILABLE

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

- X

GEORGE LERNER,
JULIUS ELLMAN,

Plaintiffs,

73 Civ. 2006

v.

CHILD GUIDANCE PRODUCTS, INC.
QUESTOR CORPORATION,

ANSWER

Defendants.

- X

Defendants, by their attorneys, answer the Complaint as follows:

1. Defendants deny any knowledge or information sufficient to form a belief with respect to the allegations set forth in Paragraph 2(a), 2(b) and 2(c).

2. Defendants deny each and every allegation set forth in Paragraph 3(a), 3(b) and 3(c) except admit that Questor Corporation is a corporation and through its division, Child Guidance Products, sued herein as Child Guidance Products, Inc., is engaged at 1055 Bronx River Avenue in the manufacture and sale of toys and educational products.

3. Defendants deny each and every allegation set forth in Paragraph 4(a) of the Complaint except admit that U. S. Letters Patent No. 2,873,693 have been issued, and specifically deny that they have been "duly and lawfully issued".

4. Defendants deny any knowledge or information sufficient to form a belief with respect to the allegation set forth in Paragraph 4(b).

5. Defendants deny each and every allegation set forth in Paragraphs 5(a), 5(b), 6, 7, 8 and 9, except admit

that defendants have received notice of plaintiffs' contentions of infringement.

WHEREFORE, defendants demand judgment dismissing the Complaing and decreeing that U. S. Patent No. 2,873,693 is invalid and not infringed by defendants, and for attorneys' fees, interest and disbursements, and for such other and further relief as to the court may seem just and proper.

Dated: New York, New York

July 16, 1973

HAYS, ST. JOHN, ABRAMSON & HEILBRO

By Edward J. Hayes
A Member of the Firm

Attorneys for Defendants
120 Broadway
New York, New York 10005
(212) 349-4141

OF COUNSEL:

DONALD R. BAHR, ESQ.
1801 Spielbusch Avenue
Toledo, Ohio

FILED
U.S DISTRICT COURT
AUG 28 3 34 PM '75
S.D. OF N.Y.

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

- X

GEORGE LERNER, JULIUS ELLMAN,

Plaintiffs,

- against -

CHILD GUIDANCE PRODUCTS, INC., QUESTOR CORPORATION,

Defendants.

- X

73 Civ. 2006 (WCC)

MEMORANDUM AND ORDER

#43012

MICROFILM
AUG 28 1975

CONNER, D. J.:

In this action for alleged infringement of plaintiffs' C. O. Musser U.S. patent 2,873,639 on a toy piano, defendants have moved for a summary judgment that none of their three accused devices infringes the patent.

None of the twelve claims of the patent is literally readable on any of the three accused devices.

The patent has only two independent claims, 1 and 7. Each calls for "a housing having a front side with an elongated slot located therein; a key support ledge attached to said front side of said housing so as to project generally parallel to said slot; [and] a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof."*

* In Claim 7, the words "key support" are omitted.

None of the three accused devices has either such a slot, or a support ledge attached to the front side of the housing, or such projections. Moreover, none of the three has keys with recesses in the bottom thereof receiving said projections and supporting said keys for rotation about said projections, as further called for in both claims. Indeed, in defendants' "Melody Bell-O-Phone" the keys are not rotatable at all, but are slidably supported for vertical reciprocation in rectangular openings in the key board.

In addition, in defendants' "Melody Bell-O-Phone," there is no "tone bar resiliently attached to each of said keys" as called for in Claims 1 and 7. Instead, the tone bars are resiliently attached to separate support members which are actuated by the keys, as in the prior Bienengraber German patent 567,657 which was cited by the Patent Office and distinguished by the patentee on the basis of having a complex linkage between the keys and the support members.

Finally, in defendants' "Melody Mike" there is not "a shaft rotatably mounted within said housing above said tone bars, said shaft being generally parallel to said slot, * * * [and] a plurality of arms attached to said shaft so as to project therefrom, each of said arms being located generally above one of said tone bars," as called for in both claims. In "Melody Mike," there is no slot through which all the keys project; the shaft extends perpendicular (not parallel)

to the plane of the keys and is not located above the tone bars but along the vertical axis of the cylindrical surface around which all of the tone bars are spaced; and there is not a separate set of arms for each tone bar located above that tone bar; instead, there is a single set of arms located opposite and at the same level as all of the tone bars.

All of the remaining ten claims of the patent incorporate by reference these same limitations, and cannot be infringed unless Claims 1 and 7 are.

There remains, of course, the question whether the claims are infringed under the doctrine of equivalents. Equivalency is an issue of fact, except, of course, where there is a file wrapper estoppel which, as a matter of law, prevents giving the claims an interpretation sufficiently broad to cover the accused devices.

The file history here almost, but not quite, creates such an estoppel. Application Claim 9, which was cancelled by the first amendment to the application, after the Bienengraber German patent had been cited, contained the substance of most of the limitations of Claims 1 and 7 except for those specifically discussed above.

However, Claim 9 did not recite that the tone bars are resiliently mounted on the keys themselves or that the

key support ledge limits rotational movement of the keys, and it is not possible to say with certainty that these additional limitations did not contribute to the allowability of Claims 1 and 7.

There thus remains the factual question whether the accused devices incorporate "equivalents" of the structure recited in Claims 1 and 7. This issue of material fact precludes summary judgment. Rule 56(c), F.R.Civ.P.

However, there appears to be sufficient doubt concerning such equivalency to warrant a separate trial limited to this one issue.

Counsel will be contacted in due course to arrange a mutually convenient date for such trial.

The motion for summary judgment is denied.

SO ORDERED.

William C. Conner
United States District Judge

Dated: New York, New York
August 28, 1975

Copy

U.S. DISTRICT COURT
FILED
DEC 30 1975
S.D. OF N.Y.

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

- X

GEORGE LERNER, JULIUS ELLMAN,

Plaintiffs,

- against -

CHILD GUIDANCE PRODUCTS, INC., QUESTOR CORPORATION,

Defendants.

73 Civ. 2006 (WCC)

OPINION AND ORDER

- X

#43628

CONNER, D. J.:

The parties and issues

This is an action for alleged infringement of U.S. Patent No. 2,873,639 which was issued on February 17, 1959 to Clair O. Musser for a toy piano.

The patent was assigned to and is owned by plaintiffs George Lerner and Julius Ellman, who are residents of the New York City area associated in the business of designing and developing toys and licensing others to manufacture them on a royalty basis.

Defendant Child Guidance Products (Child Guidance) is a division of defendant Questor Corporation engaged in the manufacture and sale of toys and educational devices and having a principal place of business in this District.

This Court has jurisdiction of the subject matter of the action under 28 U.S.C. § 1338(a). Personal jurisdiction of defendants and proper venue are conceded.

Plaintiffs charge infringement of Claims 1, 2, 3, 7, 8 and 9 of the Musser patent in suit by three models of toy pianos manufactured in the Orient and sold by Child Guidance in this country: the "Big Mouth Singers" (Exhibit 4) and two models of the "Melody Bell-O-Phone" (Exhibits 5 and 5A).

The proceedings

Before trial defendants moved for a summary judgment that none of the accused devices infringes the patent. On August 28, 1975, the Court filed its memorandum denying the motion, in which the Court ruled that, although each of the two independent Claims 1 and 7 of the patent contains five elements which are not literally readable on the accused structures, there is no file wrapper estoppel which would prevent interpretation of these elements, pursuant to the doctrine of equivalents, sufficiently broadly to cover the accused structures, and that this question of equivalency is a disputed issue of material fact which precludes summary disposition. However, the Court added that "there appears to be sufficient doubt concerning such equivalency to warrant a separate trial limited to this one issue." Such separation of the issues is possible and appropriate because the patent

in suit expires in only a few months on February 17, 1976, so that public policy does not require a determination of the issue of validity which is unnecessary to the disposition of the present controversy. Cf. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 330 (1945).

Plaintiffs had duly demanded a jury trial, but neither side objected to the Court's suggestion of dividing the trial into two parts, the first confined to the issue of infringement and the second directed to the issue of validity, the second part to commence immediately following the jury's verdict on the first.

At the commencement of the trial, it was stipulated that Claim 1 of the patent was typical of the claims in suit and that the parties would stand or fall on the final determination of its infringement and validity. It was further stipulated that all of the portions of Claim 1 save the five elements referred to previously were literally applicable to all three accused models of defendants' pianos, and that these five were not, so that the jury need consider only the issue whether or not the accused devices incorporate structures which are "equivalents" of the five elements in question -- i.e., which "do the same work in substantially the same way, and accomplish substantially the same result***." Grover Tank & Mfg. Co., Inc. v. Linde Air Products Co., 339 U.S. 605, 608 (1950).

At the conclusion of the first phase of the trial, following summations of counsel and instructions from the Court, the jury returned a special verdict that each of the three of defendants' accused devices incorporates equivalents of all five of the disputed claim elements, so that Claim 1 (and accordingly Claims 2, 3, 7, 8 and 9) of the patent are infringed.

The trial accordingly proceeded to the validity phase, which required only one-half day of court time for the introduction of additional evidence.

At the conclusion of this second phase, defendants moved for a directed verdict of dismissal. In the discussion that ensued, the Court asked counsel for both parties whether there was any disputed issue of fact which was material to the determination of validity according to the procedure decreed by Graham v. John Deere Co., 383 U.S. 1, 17-18 (1966), and whether there was any testimonial or other non-documentary evidence which required evaluation by the jury in resolving such factual issues. When both counsel answered both questions in the negative, the Court then inquired whether, under the circumstances, both sides were agreeable to the Court's discharging the jury and determining the issue of validity as a matter of law; see Julie Research Laboratories, Inc. v. Guildline Instruments, Inc., 501 F.2d 1131, 1136 (2d Cir. 1974). Both parties agreed, and further agreed to waive summations

and post-trial briefs and to let the Court decide the matter on the basis of the trial record and the papers already on file.

This opinion incorporates the Court's findings and conclusions pursuant to Rule 52(a), F.R.Civ.P.

The patented invention

The toy piano of the patent produces what is known in the trade as a "carillon" sound, and which is created by rapid repetitive striking of a chime or tone element to produce a so-called "continuous" tone, which is really a rapid series of identical percussive tones, similar to the ringing of a telephone or doorbell.

Claim 1, which is set forth in full in the margin,[1/] describes a toy piano in which the principal features of the assertedly novel combination are:

(1) the keys extend through an elongated slot in the front of the piano, and are pivotally supported on projections extending upwardly from the lower edge of the slot into recesses in the underside of the keys to prevent lateral displacement of the keys;

(2) a key support ledge extends parallel to the slot to engage the underside of the keys at their outer ends when the keys are depressed, to limit their range of pivotal movement;

(3) the tone bars are mounted directly on the keys at the upper side of their inner end portions; and

(4) a rotary striker assembly is positioned above the inner end portions of the keys, so as to strike the tone bars when they are moved into playing position by depressing the keys against the support ledge.

The dependent claims 2 and 3, which are also set forth in full in the margin,[2/] describe the details of the striker assembly: a horizontal rotary shaft (which is driven by a tiny battery-powered electric motor), a series of arms extending radially from the shaft, with a diametrically opposed pair of these arms aligned with each of the keys, and a washer loosely supported at the end of each arm. As the shaft rotates, the washers are normally urged outwardly by centrifugal force, but yield inwardly as they strike the tone bars. This arrangement provides for striking the tone bars without prolonged pressure against them which would damp their vibration and possibly even impede rotation of the shaft.

Claims 8 and 9 are identical with Claims 2 and 3, respectively, except that they are dependent on Claim 7, instead of Claim 1. Claim 7 is similar to Claim 1 except for a more detailed description of the resilient means for supporting the tone bars on the keys. No novelty is asserted for the support means per se.

The presumption of validity

As in all patent infringement actions, we begin with the presumption that the Musser patent in suit is valid, with the defendants having the burden of establishing its invalidity. 35 U.S.C. § 282.

The strength of this presumption depends, of course, on whether the Patent Office had before it at the time it granted the patent the most relevant prior art. If it did, the presumption is reinforced. Ling-Temco-Vought, Inc. v. Kollsman Instrument Corporation, 372 F.2d 263, 268 (2d Cir. 1967). If it did not, the presumption is weakened or negated altogether. Julie Research Laboratories, Inc. v. Guildline Instruments, Inc., supra, 501 F.2d at 1136; Lorenz v. F. W. Woolworth Co., 305 F.2d 102, 105, fn. 7 (2d Cir. 1962).

Here, as will be seen, the two most pertinent patents relied on by defendants had been cited and considered by the Patent Examiner, but a third patent, showing a feature whose significance the patentee's attorney emphasized during prosecution of the patent application, was not cited, nor was there any other reference disclosing this feature. The presumption is therefore probably entitled to little if any weight in this case. But, in any event, the presumption means no more than that reasonable doubts will be resolved in favor of the patentee. Reeves Bros. Inc. v. U.S. Laminating Corp., 417 F.2d 869, 872 (2d Cir. 1969). The presumption need not be "accorded the

weight of actual evidence" nor "affect a decision of invalidity that would otherwise be reached with confidence." Lorenz v. F. W. Woolworth Co., supra, 305 F.2d at 105.

The evidence of invalidity

Defendants have attacked the validity of the patent on the sole ground that the patented invention would have been obvious at the time it was made to a person having ordinary skill in the art to which it pertains. 35 U.S.C. § 103.

In determining this issue of obviousness we must begin with the "background" considerations prescribed by Graham v. John Deere Co., supra:

> "Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined." 383 U.S. at 17.

The evidence which defendants introduced to show obviousness is essentially documentary, consisting principally of a book of twenty prior patents (Defendants' Exhibit B). Defendants also adduced the testimony of a doctor of mechanical engineering explaining the construction and operation of the devices disclosed in these patents, but this testimony was based only on his reading of the patents themselves and, while

it doubtless would have been of considerable assistance to the jury in perceiving the relationship between the prior art and the invention at issue, it is wholly unnecessary to the Court's understanding of the extremely simple mechanical structures involved. Defendants also introduced the testimony of the Director of Product Development of Child Guidance to the effect that, in view of the prior patents, the claimed invention would have been obvious to a person having ordinary skill in the art. However, that testimony, even though uncontradicted, is of little weight, since it is opinion testimony of an interested witness on the ultimate issue before the Court -- an issue of law, after the underlying facts have been established. Julie Research Laboratories, Inc. v. Guildline Instruments, Inc., supra.

The prior art

There are only three of the prior patents which need be considered here, since these three disclose all of the elements of the claimed invention which are shown by any of the others, and the cumulation of the others merely serves to show the crowded state of the art.

I. Marks U.S. patent 2,052,890 (1936)

The Marks patent (Tab 9 in DX B), which was cited by the Patent Office, discloses a toy piano incorporating all of the structure described in Claim 1 which relates to the

method of supporting the keys and limiting their pivotal movement. The keys 31 (Fig. 2) extend through an elongated slot in the front 21 of the piano and, in the embodiment of Figures 7 and 8, are supported for pivotal movement on projections 66 which extend upwardly from the lower edge of the slot into recesses 68 in the underside of the keys 67. A key support ledge 24 (Fig. 2) engages the underside of keys at their outer ends to limit pivotal movement of the keys.

Depressing the keys 31 against the ledge 24 causes hammers 41 at the ends of pivotally mounted arms 40 to be thrown upwardly to strike tone bars 34 resiliently mounted above the respective keys.

K. Bassler Belgian patent 515,147 (1952)

This Belgian patent (Tab 20 in DX B), which was not cited by the Patent Office, shows a stringless, keyboard-operated musical instrument in which the tone bars are mounted directly on the keys, as exemplified by the structure of Fig. 20 in which the bar 70 is mounted on the inner end of the key 1. During prosecution of the application for the patent in suit, this feature was emphasized by Musser's attorney as making it possible for the piano to be assembled merely by dropping the keys into place (file wrapper DX A, pp. 29-30, 42-43).

A. Bienengraber German patent 567,657 (1931)

This German patent (Tab 19 in DX B), which was cited by the Patent Office, discloses a piano-type musical instrument which produces a carillon sound by means of sound-generating elements identical with those described in the patent claims in suit.

A horizontal rotary shaft C (Abb. 1) carries diametrically opposed rods e which loosely support washer-shaped hammers d which repetitively strike tone bars f when they are moved into playing position by depressing keys g on a keyboard into engagement with stops positioned beneath the keys.

The differences between the patented invention and the prior art

It is readily apparent that the complete combination described in the patent claims could be produced by modifying the toy piano of Marks only to the extent of substituting for its key-actuated hammers and fixed tone bars Bienengraber's key-actuated tone bars and rotary striker assembly. The simplest method of supporting the tone bars would of course be to mount them directly on the inner ends of the keys as taught by Bassler.

The obviousness of the differences

In determining the issue of obviousness we must assume that the patentee Musser was aware of all of this prior art when he made the invention. David & David, Inc. v. Myerson, 388 F.2d 292, 294 (2d Cir. 1968).

The conclusion seems inescapable that with Marks, Bienengraber and Bassler before him, any toy designer of ordinary skill could devise a toy piano which would produce carillon sounds. However, as I have observed before, this does not necessarily mean that the patented invention is obvious, for it assumes that the designer has started with the specific task of developing a toy piano capable of producing carillon sounds, whereas patentable ingenuity may and often does reside in the perception of a desirable goal which, once perceived, is achievable through the exercise of only routine skill. Timely Products Corp. v. Arron, ___ F.2d ___, 187 U.S.P.Q. 257, 261 (2d Cir. 1975); Plantronics, Inc. v. Roanwell Corp., _____ F.Supp. _____, 187 U.S.P.Q., 489, 502 (S.D.N.Y. 1975).

However, I do not believe that any skill beyond that of the average toy designer was involved in conceiving the objective of a toy piano producing carillon sounds, because Bienengraber's full-sized musical instrument producing such sounds was on the market, and the patentee Musser had actually seen one in Dusseldorf.

Moreover, as discussed hereinafter, Dr. Musser was not the only toy designer who visualized the desirability of a toy piano producing carillon sounds.

The secondary considerations or "signposts"

As virtually always, our final determination turns upon the "secondary considerations" referred to in Graham -- the history of the art before and after the invention:

> "[s]uch secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy." 383 U.S. at 17-18, 148 U.S.P.Q. at 467.

These are what Judge Learned Hand called the "signposts" of patentability and properly deemed infinitely more reliable than a priori evaluations aided by hindsight. Reiner v. I. Leon Co., 285 F.2d 501, 504 (2d Cir. 1960), cert. denied, 366 U.S. 929 (1961).

However, there are few "signposts" to guide our present journey.

The only evidence that plaintiffs introduced which tended to show that the invention was not obvious was that of commercial success: Dr. Musser testified on deposition that several hundred thousand of his "Bell Organ" toy pianos had been

sold and that they had been played on television shows and even on the stage at the Radio City Music Hall, where a chorus of Rockettes played them in unison.

While commercial success is indeed a makeweight for patentability, it cannot tip the balance where the obviousness of the invention is clear. Timely Products Corp. v. Arron, supra, 187 U.S.P.Q. at 258, and cases cited therein.

But plaintiffs quite unwittingly introduced some "secondary" evidence strongly tending to show the obviousness of the invention. Plaintiff Julius Ellman testified that, about 1971, he and his associate, plaintiff George Lerner, independently developed a toy piano called the "Jolly Jingle Tone" which produced a carillon sound. It was strikingly similar in construction to that of the Musser patent, likewise having tone bars mounted on the inner ends of the keys for movement into engagement with a striker assembly including a horizontal rotary shaft having radial arms with loosely mounted washers at their ends. Plaintiffs took a prototype of this device to Ideal Toy Co. for the purpose of attempting to interest them in a license to manufacture it. Ideal's Director of Research and Development, Julius Cooper, expressed enthusiasm about it, but after a patent search turned up the Musser patent, Ideal lost interest. Undaunted, plaintiffs located Dr. Musser, acquired an option on his patent, and eventually purchased it outright for $1,000. Thus armed, they went back to Ideal, but

Ideal had in the meantime learned of the similar Child Guidance toy pianos which were then being sold and declined to enter a "diluted" market pre-empted by competition.

It thus appears that, at roughly the same time the claimed invention was conceived by the patentee, Dr. Musser, it was developed by at least one other team, plaintiffs Lerner and Ellman, and, since there was no evidence of derivation by Child Guidance from either Musser or plaintiffs, perhaps by a third team as well. Such generally contemporaneous independent development is at least some evidence that the invention was not beyond the reach of those of ordinary skill in the art. Felburn v. New York Central Railroad Co., 350 F.2d 416, 426 (6th Cir. 1965), cert. denied, 383 U.S. 935 (1966).

Moreover, the nominal price tag which Dr. Musser placed on the patent does not bespeak a high esteem for the mercantile value of the invention.

On balance, the "secondary considerations" as a whole tend to demonstrate more the obviousness of the invention than its patentability. This evidence thus serves only to confirm our initial "hindsight" appraisal of the invention in light of the prior art.

Finally, it should be noted that, in its application of the doctrine of equivalents so as to find the claims in suit infringed by the accused Child Guidance devices, the jury

broadened the wording of the claims in several respects:

1) the claims were not limited so as to require that the tone bars be mounted directly on the keys, but were found sufficiently broad to cover a more complex arrangement, such as that of the two "Melody Bell-O-Phone" devices in which push buttons projecting upwardly through openings in the keyboard engage the outer ends of the pivotally mounted levers on which the tone bars are supported;

2) the claims were interpreted so as not to require a continuous key support ledge at the front of the keyboard for limiting movement of the keys and to cover separate stops in various locations.[3/]

The claims must, of course, be given the same breadth of interpretation for purposes of determining their validity as they were given in determining their infringement. Fife Mfg. Co. v. Stanford Engineering Co., 299 F.2d 223, 226 (7th Cir. 1962).

Bienengraber literally anticipates every element and feature of the structure described in the claims, except for their recitation that the tone bars are supported on the keys and that the movement of the keys is limited by a key support ledge extending across the front of the piano. But these were two of the very limitations which the jury had to disregard in order to find the patent infringed.

Thus the claims need be interpreted only slightly more broadly than they were interpreted in finding infringement,

in order for them to read fully on the disclosure of Bienengraber. Bienengraber has a key linkage with three relatively movable parts instead of one as disclosed in the Musser patent and two as employed in the "Melody Bell-O-Phone."

For all these reasons, I conclude that the invention covered by Claims 1, 2, 3, 7, 8 and 9 of the Musser patent in suit was obvious at the time it was made to persons of ordinary skill in the art, and that these claims are therefore invalid under 35 U.S.C. § 103.

The Complaint is dismissed.

SO ORDERED.

WILLIAM C. CONNER
United States District Judge

Dated: New York, New York
December 24, 1975

FOOTNOTES

1. Claim 1 reads as follows:

> 1. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a key support ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside of said housing so as to be pushed into engagement with said key support ledge so as to rotate said keys about said projections to a playing position; a tone bar resiliently attached to each of said keys so as to be moved to a playing position when said keys are moved to a playing position; a shaft rotatably mounted within said housing above said tone bars, said shaft being generally parallel to said slot; means operatively associated with said shaft and mounted in said housing for rotating said shaft; a plurality of arms attached to said shaft so as to project therefrom, each of said arms being located generally above one of said tone bars; means operatively associated with each of said arms for periodically striking one of said tone bars when said keys are actuated so as to rotate about said projections to a playing position (emphasis added).

2. Claims 2 and 3 read as follows:

> 2. A toy musical instrument as defined in claim 1 wherein said arms project radially from said shaft and wherein said arms are spaced about said shaft so as to project from said shaft in different directions.

3. A toy musical instrument as defined in claim 1 including a projection attached to each of said arms at an extremity remote therefrom, each of said projections having an enlarged end thereon; and wherein each of said means attached to said arms comprises a ring positioned on one of said projections, said rings being held on said projections by said enlarged ends and being capable of rotation about said projections.

3. The jury also interpreted the claims so as not to require a single elongated opening in the front of the piano through which all the keys extend (in the accused Child Guidance devices the keys extend through separate openings), and so as not to require projections extending upwardly from the lower edge of the opening (in the Child Guidance devices the keys are pivotally mounted on a horizontal rod which is straddled by fingers at the lower edges of the keys, the fingers resiliently snapping around the rod when the keys are pushed down onto the rod during assembly). However, since the prior Katz patent shows the precise key-supporting arrangement disclosed in the claims, it is unnecessary to broaden the claims in these respects in order for them to read literally on the prior art. In these respects the claims read on the prior art more readily than on the accused devices.

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

GEORGE LERNER, JULIUS ELLMAN,	:	
Plaintiffs,	:	Civil Action No. 73 Civ. 2006
-against-	:	
CHILD GUIDANCE PRODUCTS, INC., QUESTOR CORPORATION,	:	Judge W. C. Conner
Defendants.	:	

NOTICE OF APPEAL

Notice is hereby given that plaintiffs GEORGE LERNER and JULIUS ELLMAN named above hereby appeal to the United States Court of Appeals for the Second Circuit from the Order dismissing plaintiffs' Complaint, entered in this action on the 30th day of December, 1975.

Dated: New York, New York
January 20, 1976

PAUL J. SUTTON
Miskin & Sutton
521 Fifth Avenue
New York, New York
(212) 697-6090

Attorney for Plaintiffs

UNITED STATES DISTRICT COURT FOR THE
SOUTHERN DISTRICT OF NEW YORK

S.D. OF N.Y.

GEORGE LERNER, JULIUS ELLMAN,

Plaintiffs,

-against-

CHILD GUIDANCE PRODUCTS, INC., QUESTOR CORPORATION,

Defendants.

Judge William C. Conner

No. 73 Civ. 2006

JUDGMENT

The issues in the above entitled action having been brought on regularly for trial before the Hon. William C. Conner, United States District Judge, and a jury on December 15, 16 and 17, 1975, and the trial having been divided into two (2) parts, the first confined to the issue of infringement and the second directed to the issue of validity of an issued patent assigned to and owned by plaintiffs; and the jury having returned a special verdict that each of the three of defendants' accused devices incorporates equivalents of the disputed claim elements so that claims of the patent are infringed; and the remaining portion of the trial as to validity of the patent having been tried by the court without a jury after defendants had moved for a directed verdict of dismissal, and the parties having agreed to the discharge of the jury and to the determination of the issue of validity as a matter of law; and the court thereafter, on December 24, 1975, having handed down its opi-

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nion that the invention covered by claims of the patent in suit are invalid under 35 U.S.C. Sec. 103, and a decision to that effect having been duly rendered,

It is ORDERED AND ADJUDGED

that the plaintiffs take nothing and that the complaint be and the same hereby is dismissed on the merits, and that the defendants recover from plaintiffs their costs of this action.

Dated, New York, N. Y., this 1st day of March 1976.

SO ORDERED. March 1, 1976
New York, New York

William C. Conner

U.S.D.J.

JUDGMENT ENTERED - 3/5/76
Raymond F. Burghardt
CLERK

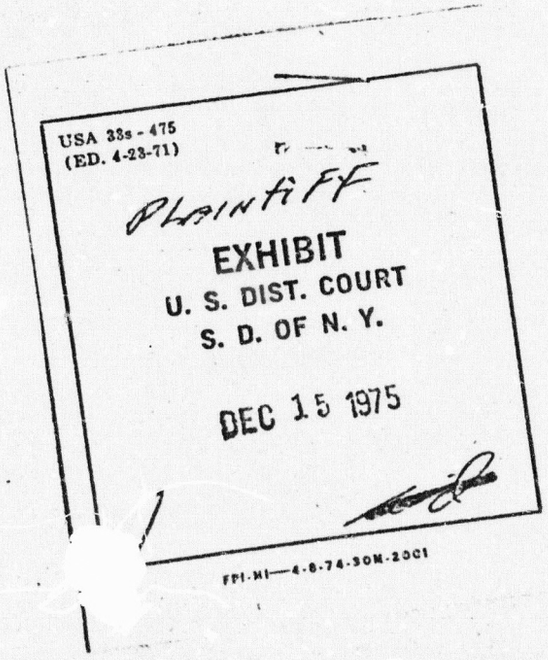
wb

55-Rev (6-61)

U. S. DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE

September 29, 1975
(Date)

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of the Printed Specification and Drawings of U. S. Patent 2,873,639.



By authority of the
COMMISSIONER OF PATENTS

W. B. Walden

Certifying Officer.

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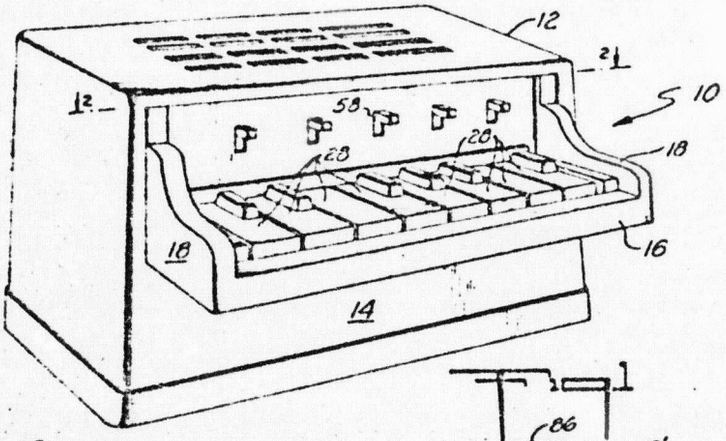
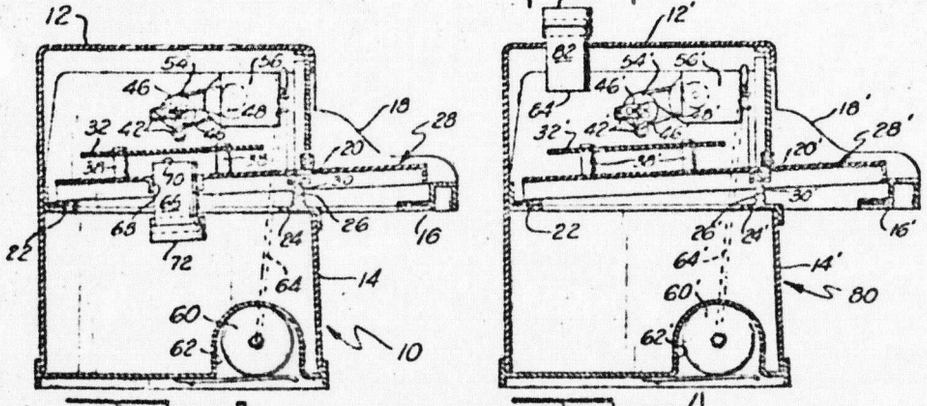
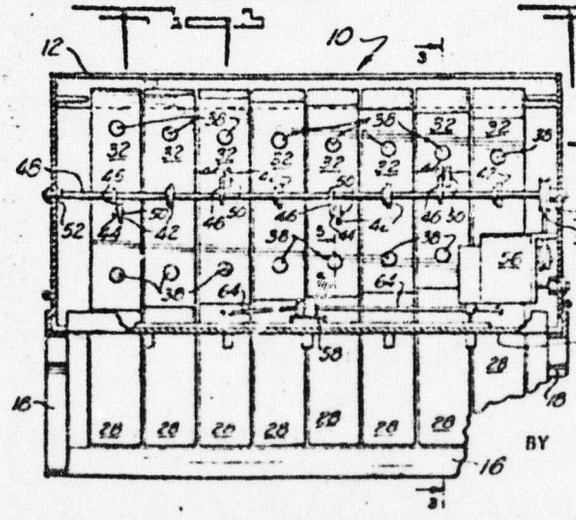
Feb. 17, 1959 C. O. MUSSER 2,873,639

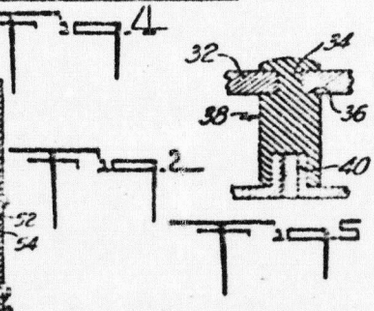
TOY PIANO HAVING KEY MOUNTED TONE BARS

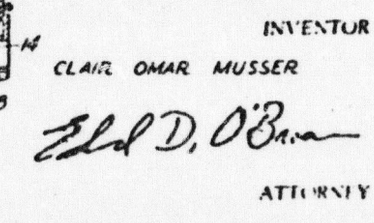
Filed Oct. 20, 1958











INVENTOR

CLAIR OMAR MUSSER

BY Ellsworth D. O'Brien

ATTORNEY

United States Patent Office 2,873,639 Patented Feb. 17, 1959

2,873,639

TOY PIANO HAVING KEY MOUNTED TONE BARS

Clair Omar Musser, Studio City, Calif.

Application October 20, 1958, Serial No. 767,981

12 Claims. (Cl. 84—404)

This invention relates to new and improved toy musical instruments.

Virtually every parent, at one time or another, by necessity suffers through a variety of disconcerting nondescript sounds produced by a child through the use of one or more common toy musical instruments. A basic objective of this invention is to provide toy musical instruments which are capable, when properly constructed, of producing more melodious noises than can be produced by many of the known similar devices.

It is thought that the disconcerting sounds so often produced by common toy musical instruments are, at least in part, a result of the manner in which these instruments are constructed. Any toy musical instrument must be comparatively rugged in order to withstand the onslaught of the younger generation, further, it must be capable of being easily and conveniently produced on a mass production basis, at a cost which is not prohibitive. An object of this invention is to provide toy musical instruments which can be easily and conveniently produced by mass production techniques, and which, in spite of such production, are capable of producing comparatively harmonious, acceptable noises. A related object of the invention is to provide toy musical instruments which are rugged in construction so that it is comparatively impossible for the normal child to damage them, except with deliberate malice.

A further object of this invention is to provide toy musical instruments capable of producing sound effects closely resembling the sound effects which may be achieved by much more expensive adult instruments such as organs or the like. This latter objective of the invention is quite important inasmuch as children inherently try to imitate parents, and like to play with toys which bear at least a superficial resemblance, in appearance and performance, to apparatus or equipment which their parents use. The new toy musical instrument of this invention can be made to resemble in outward appearance a piano, or by appropriate inclusion and construction of resonating means, an organ. Through the use of special means for actuating sound generating elements employed with the toy musical instruments of this invention, it is possible to very closely simulate the sound produced by an electric organ. Such sound effects have not, it is thought, been satisfactorily achieved in any low cost device of the class described prior to this invention.

Further objects of this invention, as well as many specific advantages of it, will be more fully apparent from the remainder of this description, including the appended claims and the accompanying drawing in which:

Fig. 1 is a perspective view of a toy musical instrument of this invention;

Fig. 2 is a cross sectional view taken at line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional view taken at line 3—3 of Fig. 2;

Fig. 4 is a view similar to Fig. 3 of a modified toy musical instrument of this invention; and

Fig. 5 is a partial cross-sectional view taken at line 5—5 of Fig. 2.

In all figures of the drawing, like numerals are used to designate like parts whenever convenient for purposes of illustration and explanation. It is to be understood that this invention is not to be considered as being limited to structures having the precise proportional sizes or shapes illustrated inasmuch as a number of modifications may be made in the structures shown without departing from the essential nature of the present invention.

The actual features of this invention are considered to be fully defined or summarized in detail by the appended claims forming a part of this description. If desired, however, as an aid to understanding the invention, it may be briefly stated in summary form that this invention relates to toy musical instruments, each of which includes a support member, a plurality of arms movably mounted on this support member, a sound generating element mounted on each of these arms so as to be moved when each of the arms, is moved, and means for actuating each of these said sound generating elements so as to produce sound, these means being mounted on the support member adjacent to the arms so that when said arms are moved the sound generating elements are moved into a location where they are actuated by these means, causing sound to be produced.

In Fig. 1 of the drawing there is shown a toy musical instrument of the invention 10, which includes a housing 12 in the general shape of a rectilinear box having attached to the front side 14 thereof a ledge 16. This ledge is secured to the housing by means of end supports 18; it is located so as to be generally parallel to an elongated slot 20 formed in the front side 14 approximately midway between the top of the bottom of the housing 12. Within the housing 12 there is located an elongated support member 22 so that this support member is positioned generally parallel to the slot 20. An elongated bar 24 is mounted on the housing 12 so as to project through the slot 22, and so that a series of elongated projections 26 formed thereon project upwards generally toward the center of this slot.

Upon each of the projections 26 there is positioned a key or arm 28 so that an elongated recess 30 within the bottom of each of these keys fits over one of the projections 26. The recesses 30 are preferably of larger cross-sectional dimension than the projections 26 so that the keys 28 are capable of being rotated about these projections during the operation of the instrument 10. Thus in effect the projections 26 may be termed "fulcrums." The lengths of the recesses 30 and of the projections 26 are preferably the same so as to hold the keys 28 against movement along the length of the slot 20.

The keys themselves normally are located as shown in Fig. 3 of the drawings so that portions of them rest against the support member 22. As is best seen in the drawings, the extremities of the keys 28 furthest removed from the housing 12 are, in this position, spaced from the ledge 16 so that a child or other individual playing the instrument 10 can push upon any of the keys 28 rotating the key so actuated about a projection 26 in order to bring a tone bar 32 into engagement with the means for actuating this tone bar. The tone bars 32 are, with the preferred construction of the invention, formed so as to each include two openings 34 located therein so that these tone bars may be supported in notches 36 on resilient rubber supports 38. These supports 38 fit over cylindrical projections 40 formed on the keys 28 as shown in Fig. 5. Thus, the supports 38 resiliently hold

the tone bars 32 upon the keys 28 so these tone bars are free to vibrate.

The tone bars 32 can be conveniently formed out of a number of commonly available materials such as stainless steel, aluminum or the like; they are so proportioned in size and dimension to produce a series of notes when the keys 28 are actuated. It is necessary that the supports 38 be formed out of a resilient material such as rubber or the like, if the vibrations produced by the tone bars 32 are not to be transmitted through the keys 28 when the instrument 10 is played. These keys may be conveniently formed out of wood or any common material such as polystyrene or the like, with a minimum of difficulty. In the preferred mode of manufacturing of the instrument 10, the tone bars 32 are assembled upon the keys 28 prior to the insertion of these keys within the housing 12.

The means for actuating the tone bars 32 so as to produce sound in the instrument 10 preferably comprise a plurality of percussion rings 42 formed out of metal or the like. These rings 42 are rotatably mounted upon projections 44 on arms 46 secured to a shaft 48; the rings 42 are prevented from coming off of the projections 44 by means of enlarged ends 50 on these projections. The shaft 48 is carried by bearings 52 secured to the housing 12; this shaft is adapted to be driven through a belt and pulley arrangement 54 by means of an electric motor 56 disposed within the housing 12. A switch 58 is attached to the front side 14 of the housing 12 in order to turn this motor on and off. If desired, the motor can be of the category which may be operated by household current supplied to the instrument 10 through an electric cord (not shown) or, if desired, this motor 56 may be actuated by conventional electric batteries 60 disposed in a battery cavity 62 within the housing 12. Internal wires 64 are employed to connect the batteries 60, the motor 56 and the switch 58 in a conventional manner.

It will be noted from an examination of Figs. 2 and 3 of the drawings that the arms 46 preferably project radially from the shaft in different directions. This is so that as the instrument 10 is played that the various rings 42 do not strike one or more of the tone bars 32 simultaneously so as to obtain a more pleasing musical effect than if all of the tone bars were actuated at one time.

The actual operation of the instrument 10 is relatively simple. A child merely presses upon one or more of the keys 28 bringing the tone bar 32 attached to each key so actuated into an upper position in which this tone bar is so spaced with respect to the shaft 48 that it is capable of being engaged by a ring 42. As the shaft turns, any such ring periodically engages the corresponding tone bar causing sound to be produced by this tone bar. In effect, a tremolo effect is thus produced. This tremolo effect achieved with the present invention closely resembles the tone which is obtained by an electric organ, and it is considered to be pleasing.

The use of the percussion rings 42 in the instrument 10 is noted. During the operation of the instrument these rings 42 are rotated about the projections 44 through engagement with the corresponding tone bars 32; also these rings can move slightly upon the projections 44 so that as they strike a tone bar a sharp blow is not applied to the tone bar, but instead the tone bar is actuated in a more gentle manner so as to produce vibrations. Thus, with this construction no sounds resembling the hitting of an anvil with a hammer result; the only musical tone noticed is one corresponding to the desired tone produced by a tone bar.

When it is desired to reinforce the tones produced by a tone bar 32 after the key 28 has been released, it is possible to dispose resonating columns 66 upon the keys 28 in the manner indicated in Fig. 3 of the drawing. The columns 66 are held within openings 68 in the keys

28 by an adhesive or other equivalent means. Each of the columns 66 has an open end 70 spaced from the center of a tone bar 32, and has a closed end 72 remote from this tone bar. The columns 66 appear as common tubes or cylinders.

The sizes of the column 66 are, of course, varied. In general the larger the tone bar 32, the longer the column 66 disposed beneath it is. These columns 66 are of such a dimension so as to effectively reinforce the tones or notes generated by vibration of corresponding tone bars 32. Because of the fact that the tone bars 32 are mounted on the keys 28 so as to be permanently spaced with respect to the resonating columns 66, the operation of these resonating columns is unaffected by the movement of the keys 28.

If desired, it is possible to provide a toy musical instrument 80 as shown in Fig. 4 of the drawing in which tone reinforcement by a resonating column varies as the instrument is played. Since the instrument 80 is identical with the instrument 10 previously described except for the resonating column structure the various identical parts of the instrument 80 are shown in the drawing designated by the primes of the numerals previously employed.

In the instrument 80 resonating columns 82 are employed instead of the columns 66 previously indicated. These columns 82 are graduated as to size in the same manner as the columns 66, and are provided with open ends 84 adjacent to, and above the ends of corresponding tone bars 32', and are provided with closed ends 86. With this construction as a key 28' is rotated so as to move the tone bar 32' attached to its so that this tone bar is engaged by a ring 42' in order to produce sound the spacing between this tone bar 32' and the corresponding column 82 is changed. As long as a key 28' is held so that its tone bar 32' is engaged by a maximum amount of sound reinforcement by the corresponding column 82 occurs. When the key 28' is is released the spacing between the tone bar 32' held by it and this resonating column increases, and the amount of sound reinforcement by the column 82 decreases quite rapidly because of this.

Those skilled in the art to which this invention pertains will realize that a large number of modifications may be made in the structures shown without departing from the essential nature of this invention. For this reason, the invention is to be considered as limited only by the appended claims forming a part of this description. Those skilled in the art to which this invention pertains will also realize that the various structures indicated herein are each very efficient to the purpose intended, are easily and cheaply manufactured, and are comparatively rugged. They will also realize that these structures are capable of producing pleasing sounds when actuated by a child.

This application is a continuation-in-part of the co-pending application Serial No. 561,420, filed January 26, 1956, entitled Toy Musical Instruments. The subject matter of this co-pending application is incorporated herein by reference.

I claim:

1. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a key support edge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside of said housing so as to be pushed

into engagement with said key support ledge so as to rotate said keys about said projections to a playing position; a tone bar resiliently attached to each of said keys so as to be moved to a playing position when said keys are moved to a playing position; a shaft rotatably mounted within said housing above said tone bars, said shaft being generally parallel to said slot; means operatively associated with said shaft and mounted in said housing for rotating said shaft; a plurality of arms attached to said shaft so as to project therefrom, each of said arms being located generally above one of said tone bars; means operatively associated with each of said arms for periodically striking one of said tone bars when said keys are actuated so as to rotate about said projections to a playing position.

2. A toy musical instrument as defined in claim 1 wherein said arms project radially from said shaft and wherein said arms are spaced about said shaft so as to project from said shaft in different directions.

3. A toy musical instrument as defined in claim 1 including a projection attached to each of said arms at an extremity remote therefrom, each of said projections having an enlarged end thereon; and wherein each of said means attached to said arms comprises a ring positioned on one of said projections, said rings being held on said projections by said enlarged ends and being capable of rotation about said projections.

4. A toy musical instrument as defined in claim 1 including a resonating column mounted adjacent to each of said tone bars, each of said resonating columns having an open end located immediately adjacent to one of said tone bars.

5. A toy musical instrument as defined in claim 4 wherein each of said resonating columns is mounted upon one of said keys.

6. A toy musical instrument as defined in claim 4 wherein said resonating columns are mounted on said housing.

7. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside of said housing so as to be pushed into engagement with said key support ledge so as to rotate said keys about said projections; means extending upwards from each of said keys within said housing; resilient means located above each of said keys with respect to said means projecting upwards from said keys; a tone bar positioned upon said resilient means above each of said keys, each of said tone bars being held closely against lateral movement by said means projecting upwards from each of said keys; a shaft rotatably mounted within said housing above said tone bars, said shaft being generally parallel to said slot; means mounted in said housing for rotating said shaft; a plurality of arms attached to said shaft so as to project therefrom, each of said arms being located generally above one of said tone bars; means attached to each of said arms for striking one of said tone bars when said keys are actuated so as to rotate about said projections.

8. A toy musical instrument as defined in claim 7 wherein said arms project radially from said shaft and wherein said arms are spaced about said shaft so as to project from said shaft in different directions.

9. A toy musical instrument as defined in claim 7 including a projection attached to each of said arms at an extremity remote therefrom, each of said projections having an enlarged end thereon; and wherein each of said means attached to said arms comprises a ring positioned on one of said projections, said rings being held on said projections by said enlarged ends and being capable of rotation about said projections.

10. A toy musical instrument as defined in claim 7 including a resonating column mounted adjacent to each of said tone bars, each of said resonating columns having an open end located immediately adjacent to one of said tone bars.

11. A toy musical instrument as defined in claim 10 wherein each of said resonating columns is mounted upon one of said keys.

12. A toy musical instrument as defined in claim 10 wherein said resonating columns are mounted on said housing.

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ASSIGNMENT

WHEREAS, CLAIR OMAR MUSSER (also known as C. O. Musser), residing at 12997 Blairwood Drive, Studio City, California 91604 (hereinafter referred to as "assignor") is vested with all right, title and interest in certain letters patent of the United States of America, enumerated below, together with the right to recover all damages and profits by reason of past and present infringements thereof by any person, firm, association or corporation, to wit, No. 2,871,746 dated February 3, 1959 issued to C. O. Musser for Toy Musical Instrument, and No. 2,873,639 dated February 17, 1959 issued to C. O. Musser for Toy Piano having Key Mounted Tone Bars; and

WHEREAS, said assignor does hereby warrant that he is the sole and absolute owner of said patents and has the full right to sell and transfer the same and that said patents and each and every part thereof are free and clear of any liens, mortgages, debts or other encumbrances of whatsoever kind or nature, and that there are no judgments existing against him in any court nor are there any replevins, attachments, executions issued against him by reason of said patents; and

WHEREAS, GEORGE LERNER, residing at 12 Prospect Court, Freeport, New York, and JULIUS ELLMAN, residing at 1672 East 7th Street, Brooklyn, New York, (hereinafter referred to as "assignees") are desirous of acquiring the entire right, title and interest in and to and under said U.S. letters patent;

NOW, THEREFORE, to all it may concern, be it known that, for and in consideration of the sum of One Thousand ($1,000.00) Dollars in hand paid to said assignor by said assignees and of other and good and valuable consideration, the receipt whereof is hereby acknowledged, the said Clair Omar Musser (also known as C. O. Musser) has assigned, sold, transferred and set over and by these presents does assign, sell, transfer and set over unto the said George Lerner and Julius Ellman his entire right, title and interest to and under each and all of the said patents and the inventions thereof, and in, to and under any reissue or reissued extension or extensions thereof, the same to be held and enjoyed by the said George Lerner and Julius Ellman, their executors, administrators, successors and assigns, together with any and all royalties, earnings, past due or to become due, to said assignor, for their own proper use and benefit and for the use and behoof of their executors, administrators, ~~administrators,~~ successors and assigns, to the end of the term or terms for which said letters patent are granted or issued or may be extended, renewed or reissued, as fully and entirely as the same would have been held and enjoyed by said assignor had this sale and assignment not been made;

TOGETHER WITH ALL CLAIMS for damages and profits by reason of past and present infringements of said letters patent by any person, firm, association or corporation, with the right to sue and collect

the same for their own use and behoof, and for the use and behoof of their executors, administrators, successors and assigns.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal at Studio City, California on this 25th day of August, 1972.

Clair Omar Musser (L. S.)

In the Presence of

Gladys I. Boynton
Notary

STATE OF CALIFORNIA)
COUNTY OF) ss.:

On this 25th day of August, 1972, before me came Clair Omar Musser, also known as C. O. Musser, to me known and known to me to be the individual described in and who executed the foregoing instrument, and he acknowledged to me that he executed the same.

OFFICIAL SEAL
GLADYS I. BOYNTON
NOTARY PUBLIC — CALIFORNIA
PRINCIPAL OFFICE IN
LOS ANGELES COUNTY
My Commission Expires March 23, 1976

Gladys I. Boynton
Notary Public
Gladys I. Boynton

USA 33s - 475
(ED. 4-23-71)

Plaintiff
EXHIBIT
U. S. DIST. COURT
S. D. OF N. Y.
DEC 15 1975
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FPI-NI—4-8-74-30M-2001

MUSSER FILE HISTORY

1 OF 3

DEFENDANT'S EXHIBIT NO. A

561420 SERIAL NO. (Series of 1948)	P. R. Div.		PATENT NUMBER
Assistant examiner	Class	Subclass	DATED
Division No. 5	Filed complete (Date) JAN 26, 1956	Serial No. 561 420	CLAIMS FOREIGN PRIORITY: Country / Date

Applicant(s)

MUSSER, CLAIR OLIVER

STUDIO CITY, CALIF.

Number claims allowed	Print claim(s)	Class	Subcl.

Assignor to

Title of invention

TOY MUSICAL INSTRUMENTS

☐ Division of ☐ Continuation of ☐ Substitute for abandoned ☐ Continuation-in-part of

APPLICATION

Serial No.	Filed

Now Patent No.	Granted

APPLICATION Serial No. / Filed

Sh. drw.	Extra claims	Filing fee	Transaction	Atty's docket
2		$30	30799	173

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PARTS OF APPLICATION FILED SEPARATELY

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FILE NO. 178

CLAIR CHAR MUSSER

TOY MUSICAL INSTRUMENT

This invention relates to new and improved toy musical instruments.

Virtually every parent, at one time or another, by necessity suffers through a variety of disconcerting nondescript sounds produced by a child through the use of one or more common toy musical instruments. A basic objective of this invention is to provide toy musical instruments which are capable, when properly constructed, of producing more melodious noises than can be produced by many of the known similar devices.

It is thought that the disconcerting sounds so often produced by common toy musical instruments are, at least in part, a result of the manner in which these instruments are constructed. Any toy musical instrument must be comparatively rugged in order to withstand the onslaught of the younger generation; further, it must be capable of being easily and conveniently produced on a mass production basis, at a cost which is not prohibitive. An object of this invention is to provide toy musical instruments which can be easily and conveniently produced by mass production techniques, and which, in spite of such production, are capable of producing comparatively harmonious, acceptable noises.

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A related object of the invention is to provide toy musical instruments which are rugged in construction so that it is comparatively impossible for the normal child to damage them, except with deliberate malice.

A further object of this invention is to provide toy musical instruments capable of producing sound effects closely resembling the sound effects which may be achieved by much more expensive adult instruments such as organs or the like. This latter objective of the invention is quite important inasmuch as children inherently try to imitate parents, and like to play with toys which bear at least a superficial resemblance, in appearance and performance, to apparatus or equipment which their parents use. The new toy musical instruments of this invention can be made to resemble in outward appearance a piano, or by appropriate inclusion and construction of resonating means, an organ. Through the use of special means for actuating sound generating elements employed with the toy musical instruments of this invention, it is possible to very closely simulate the sound produced by an electric organ. Such sound effects have not, it is thought, been satisfactorily achieved in any low cost device of the class described prior to this invention.

Further objects of this invention, as well as many specific advantages of it, will be more fully apparent from the remainder of this description,

including the appended claims and the accompanying drawings in which:

Fig. 1 is a perspective view of a toy musical instrument of this invention;

Fig. 2 is a cross sectional view taken at line 2-2 of Fig. 1;

Fig. 3 is a cross sectional view taken at line 3-3 of Fig. 2;

Fig. 4 is an expanded perspective view showing the relationship of certain parts illustrated in a preceding Figure;

Fig. 5 is a detailed view partially in section of a resonating column such as is employed in the toy musical instrument shown in Fig. 1;

Fig. 6 is a perspective view illustrating certain parts of a modified toy musical instrument of this invention having the same general outward appearance as the toy musical instrument shown in Fig. 1;

Fig. 7 is a partial view similar to Fig. 3 of this modified toy musical instrument;

Fig. 8 is a side sectional view similar to part of Fig. 3 illustrating a resonating column structure which may be employed with the invention;

Fig. 9 is a detailed diagrammatic view showing the dimension of a resonating column such as is shown in Fig. 5 of the drawings with respect to a sound generating element employed;

Fig. 10 is a side view of a modified key and sound generating element structure which may, if desired, be employed instead of the key and

sound generating element structure indicated in any of the preceding drawings;

Insert C

In all figures of the drawings, like numerals are used to designate like parts wherever convenient for purposes of illustration and explanation. It is to be understood that this invention is not to be considered as being limited to structures having the precise proportional sizes or shapes illustrated inasmuch as a number of modifications may be made in the structures shown without departing from the essential nature of the present invention.

The actual features of this invention are considered to be fully defined or summarized in detail by the appended claims forming a part of this description. If desired, however, as an aid to understanding the invention, it may be briefly stated in summary form that this invention relates to toy musical instruments, each of which includes a support member, a plurality of arms movably mounted on this support member, a sound generating element mounted on each of these arms so as to be moved when each of the arms is moved, and means for actuating each of these said sound generating elements so as to produce sound, these means being mounted on the support member adjacent to the arms so that when said arms are moved the sound generating elements are moved into a location where they are actuated by these means, causing sound to be produced.

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In order to completely understand this invention, it is considered that it is necessary to define certain terms used in this specification inasmuch as there may be some confusion with respect to the terminology of what, in effect, are common elements of musical devices. As used herein, the term "sound generating element" is intended to designate any member such as a bar, rod or reed, which may be mounted so that when such an element is engaged by another member of appropriate construction, sound is produced. The term "means for actuating a sound generating element" is used herein to describe or designate any element, whether fixed or movable which, when brought into contact with a sound generating element, causes sound to be produced by this sound generating element. The term "means for reinforcing the sound produced by a sound generating element" is used in this specification to designate any common means such as air resonating column which may be so constructed so as to give rise to vibrations serving to reinforce the sound produced by a sound generating element. The term "arms" is used in this application to designate any movable member such as a key or the like which is intended to be actuated by one utilizing an instrument as herein defined, in order to produce sound from such an instrument.

In Fig. 1 of the drawings there is shown a toy musical instrument of the invention 10, which includes a housing 12 in the general shape of a rectilinear box having attached to the front side 14 thereof a ledge 16. This ledge is secured to the housing 12 by means of end supports 18; it is located

so as to be generally parallel to an elongated slot 20 formed in the front side 14 approximately midway between the top of the bottom of the housing 12. Within the housing 12 there is located an elongated support member 22 so that this support member is positioned generally parallel to the slot 20. An elongated bar 24 is mounted on the housing 12 so as to project through the slot 22, and so that a series of elongated projections 26 formed thereon project upwards generally towards the center of this slot.

Upon each of the projections 26 there is positioned a key or arm 28 so that an elongated recess 30 within the bottom of each of these keys fits over one of the projections 26. The recesses 30 are preferably of larger cross-sectional dimension than the projections 26 so that the keys 28 are capable of being rotated about these projections during the operation of the instrument 10. Thus in effect the projections 26 may be termed fulcrums. The lengths of the recesses 30 and of the projections 26 are preferably the same so as to hold the keys 28 against movement along the length of the slot 20.

The keys themselves normally are located as shown in Fig. 3 of the drawings so that portions of them rest against the support member 22. As is best seen in the drawings, the extremities of the keys 28 furthest removed from the housing 12 are in this position spaced from the ledge 16 so that

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a child or other individual playing the instrument 10 can push upon any of the keys 28 rotating the keys so actuated about the projections 26 in order to bring a tone bar 32 into engagement with means for actuating this tone bar. The tone bars 32 are with the preferred construction of the invention formed so as to each include two openings 34 located therein so that these tone bars may be loosely supported about pin-like projections 36 extending upward from the keys 28 upon resilient washers 38 positioned about these projections. If desired, enlarged heads 40 may be provided upon the projections 36 in order to prevent dislodgment of the tone bars 32 when the instrument 10 is moved.

The tone bars 32 can be conveniently formed out of a number of commonly available materials such as stainless steel, aluminum or the like; they are so proportioned in size and dimension to produce a series of notes when the keys 28 are actuated. It is necessary that the washers 38 be formed out of such material as felt, paper, polyvinyl resin, rubber or the like, if the vibrations produced by the tone bars 32 are not to be transmitted through the keys 28 when the instrument 10 is played. These keys may be conveniently formed out of wood or any common material such as polystyrene or the like, with a minimum of difficulty. In the preferred mode of manufacturing of the instrument 10, the tone bars 32 are assembled upon the keys 28 prior to the insertion of these keys within the housing 12.

The means for actuating the tone bars 32 so as to produce sound in the instrument 10 preferably comprise a plurality of percussion rings 42 formed out of metal or the like. These rings 42 are rotatably mounted upon projections 44 on arms 46 secured to a shaft 48; the rings 42 are prevented from coming off of the projections 44 by means of enlarged ends 50 on these projections. The shaft 48 is carried by bearings 52 secured to the housing 12; this shaft is adapted to be driven through a belt and pulley arrangement 54 by means of an electric motor 56 disposed within the bottom of the housing 12. A switch 58 is attached to the front side 14 of the housing 12 in order to turn this motor on and off. If desired, the motor can be of the category which may be operated by household current supplied to the instrument 10 through an electric cord 60, or if desired, this motor 56 may be actuated by electric batteries disposed within the housing 12.

It will be noted from an examination of Figs. 2 and 3 of the drawings that the arms 46 preferably project radially from the shaft in different directions. This is so that as the instrument 10 is played that the various rings 42 do not strike one or more of the tone bars 32 simultaneously so as to result in a more pleasing musical effect than if all of the tone bars were actuated at one time.

The actual operation of the instrument 10 is relatively simple. A child merely presses upon one or more of the keys 28 bringing the tone bar 32 attached to each key so actuated into an upper position in which this tone bar is so spaced with respect to the shaft 48 that it is capable of being engaged by a ring 42. As the shaft turns, any such ring periodically engages the corresponding tone bar causing sound to be produced by this tone bar. In effect, a tremulo effect is thus produced. This ~~treble~~ tremulo effect with the present invention closely resembles the tone which is obtained by an electric organ, and it is considered to be pleasing.

The use of the percussion rings 42 in the instrument 10 is to be specifically noted. During the operation of the instrument these rings 10 are rotated about the projections 44 through engagement with the corresponding tone bars 32; also these rings can move slightly upon the projections 44 so that as they strike a tone bar a sharp blow is not applied to the tone bar, but instead the tone bar is actuated in a more gentle manner so as to produce vibrations. Thus with this construction no sounds resembling the hitting of an anvil with a hammer result; the only musical tone noticed is one corresponding to the desired tone produced by a tone bar.

Within the instrument 10 there are mounted a series of air resonating columns 62, each having an open bottom 64 located immediately above one of the tone bars 32. These resonating columns 62 are

so dimensioned so as to reinforce the tone produced by the corresponding tone bar 32, materially increasing the sound produced through the actuation of any of the keys 28. It should be noted that the space in between the open bottoms 64 and the tone bars 32 is changed in the instrument 10 as the keys 28 are actuated and released. Thus tone reinforcement is substantially obtained only when a key 28 is pressed down, and substantially no tone reinforcement is obtained when a key 28 is released even though the tone bar 32 mounted upon such a key continues to vibrate.

The air columns 62 described are in the structure shown mounted upon the housing 12 so as to project from the top thereabove in such a manner as to give an appearance to the instrument 10 resembling a common pipe organ. If desired, the resonating columns 62 may be replaced by resonating columns 66 such as are shown in Fig. 8 of the drawings. These resonating columns 66 differ from the columns 62 in that they are bent in such a manner as to lie flat against the top of the housing 12. If desired, they may be totally located within this housing.

When it is desired to reinforce the tones produced by a tone bar 32 after the key 28 has been released, it is possible to dispose a resonating column 68 similar to any of the columns 62 previously described upon the keys 28 in the manner indicated in Figs. 6 and 7 of the drawings so that

these columns 68 each have an opening 70 located immediately beneath a tone bar 32. The column 68 can be formed integrally with the keys 28 if desired.

It is also possible to modify the instrument 10 so as to produce another similar toy instrument 72 which utilizes a different means for actuating the tone bars 32. As shown in Fig. 6 and 7 of the drawings, this instrument 72 includes two resilient mounting bars 74 formed out of spring steel or the like which are located within the housing 12 so as to project therefrom. Attached to the two mounting bars 72 is a support bar 76, which may be of wood, lucite or the like. This support bar is used to carry a plurality of resilient arms 78 formed out of spring steel or other equivalent material so that as the support bar 76 is vibrated by a common electric vibrator 80 attached to the housing 12 small hammers 82 attached to the ends of the resilient bars 78 are caused to vibrate up and down. These hammers hit against any of the tone bars 32 mounted upon any of the keys 28 actuated. Thus the spacing of the hammers 82 is such that they do not engage the tone bars 32 unless a particular key containing a tone bar is pressed down. The hammers 82 may be of metal or of a softer material such as hard rubber or the like. The electric vibrator 80 may be actuated by batteries disposed

within the housing 12, or may be directly actuated by a household current supplied to the instrument 72 through an electric cord 60. A switch 58 as previously described is, of course, employed with the instrument 72.

It is not to be assumed from the aforegoing discussion that this invention is limited to tone bars which are disposed upon movable keys so as to be movable therewith. As is shown in Fig. 10 of the drawings, it is possible to substitute other sound generating elements for such tone bars. In the structure shown in Fig. 10, a common tuning fork 84 attached to a key 28 which is otherwise constructed in the manner previously described by means of a bolt 86.

The use of a resonating column to reinforce the sound produced in any of the constructions previously described is exceedingly important in obtaining sound volume from the instruments indicated. It is preferred with the invention to utilize air resonating columns as indicated in Fig. 5 of the drawings having a closed end 88, although other resonating means and columns can be employed. It is also preferred that the resonating columns 62, 66 or 68 be of larger internal diameter than the width of a tone bar 32 in order to obtain maximum sound reinforcement as indicated in Fig. 9 of the drawings.

Those skilled in the art to which this invention pertains will realize that a large number of modifications may be made in the structures shown without departing from the essential nature of this invention. For this reason, the invention is to be considered as limited only by the appended claims forming a part of this description. Those skilled in the art to which this invention pertains will also realize that the various structures indicated herein are each very efficient for the purpose intended, are easily and cheaply manufactured, and are comparatively rugged. They will also realize that these structures are capable of producing pleasing sounds when actuated by a child.

1. A toy musical instrument of the category described, which includes: a support member; a plurality of arms movably mounted on said support member; a sound generating element mounted on each of said arms so as to be movable therewith; and means for actuating said sound generating elements mounted on said support member adjacent to said arms so that when said arms are moved said sound generating elements are actuated by said means for actuating said sound generating elements, causing sound to be produced.

2. A toy musical instrument, as defined in claim 1, which includes: means for the reinforcement of the sound produced by said sound generating elements positioned adjacent to each of said sound generating elements upon said support member.

3. A toy musical instrument as defined in claim 1, including: means for moving said means for actuating said sound generating elements.

4. A toy musical instrument which includes: a support member having a projection extending therefrom; a key having a recess located in the bottom thereof positioned so that said recess is engaged by said projection, said key being capable of being rotated about said projection; a sound generating element mounted on said key so as to be movable therewith; and means for actuating said sound generating element located adjacent to said sound generating element so that when said key is rotated about said projections said sound generating element is moved into an engagement with said means for actuating said sound generating element, causing sound to be produced.

5. A toy musical instrument which includes: a support member; a key rotatably mounted upon said support member so as to extend therefrom; a tone bar mounted on said key so as to be capable of vibration thereon; means for engaging said tone bar so as to cause said tone bar to vibrate, producing sound, said means being operatively attached to said support member adjacent to said tone bar so as to be normally spaced from said tone bar whereby said key may be rotated so as to bring said tone bar into engagement with said means for engaging said tone bar, causing sound to be produced; and a resonating column positioned adjacent to said tone bar, said resonating column serving to reinforce the sound produced by said tone bar.

6. A toy musical instrument as defined in claim 5, wherein said resonating column is mounted on said key adjacent said tone bar.

7. A toy musical instrument as defined in claim 5 wherein said resonating column is mounted on said support member immediately adjacent to said tone bar so that the spacing between said resonating column and said tone bar is varied when said key is actuated.

8. A toy musical instrument which includes: a shaft; means for rotating said shaft; an arm attached to said shaft so as to project radially therefrom; a ring rotatably attached to said arm at a point remote from said shaft; a sound generating element positioned adjacent to said shaft; and means for moving said sound generating element so that as said shaft is rotated said ring hits against said sound generating element causing said sound generating element to be actuated to produce sound.

9. A toy musical instrument which includes: a rotatable shaft; means for rotating said shaft; a plurality of arms attached to said shaft so as to project radially therefrom in different directions, said arms being spaced from one another; a ring attached to each of said arms at a point remote from said shaft, said

rings being rotatably mounted upon said arms so that their axes of rotation are equidistant from the axis of said shaft; a plurality of sound generating elements located adjacent to said shaft so as to be sufficiently far removed from said shaft so as not to be engaged by said rings or said arms when said shaft is rotated; and means for moving said sound generating elements towards said shaft whereby said sound generating elements are engaged by said rings when said shaft is rotated, causing sound to be produced by said sound generating elements.

10. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside

rings being rotatably mounted upon said arms so that their axes of rotation are equidistant from the axis of said shaft; a plurality of sound generating elements located adjacent to said shaft so as to be sufficiently far removed from said shaft so as not to be engaged by said rings or said arms when said shaft is rotated; and means for moving said sound generating elements towards said shaft whereby said sound generating elements are engaged by said rings when said shaft is rotated, causing sound to be produced by said sound generating elements.

10. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside

15. A toy musical instrument which includes: a resiliently mounted support bar; means operatively associated with said support bar for vibrating said support bar; a plurality of resilient arms attached to said support bar so as to project therefrom; hammer means attached to the extremity of each of said resilient arms remote from said support bar; a sound generating element located adjacent to said hammer means so as to be spaced therefrom and so as not to be engaged by said hammer means when said support bar is vibrated causing said resilient arms and said hammer means to move; and key means for moving said sound generating elements towards said hammer means so that said sound generating element is engaged by said hammer means when said support bar is vibrated.

16. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses

of said housing so as to be pushed into engagement with said key support ledge so as to rotate said keys about said projections; means extending upwards from each of said keys within said housing; resilient means located above each of said keys with respect to said means projecting upwards from said keys; a tone bar positioned upon said resilient means above each of said keys, each of said tone bars being held closely against lateral movement by said means projecting upwards from each of said keys; a shaft rotatably mounted within said housing above said tone bars, said shaft being generally parallel to said bars; means mounted in said housing for rotating said shaft; a plurality of arms attached to said shaft so as to project therefrom, each of said arms being located generally above one of said ~~keys~~ tone bars; means attached to each of said arms for striking one of said tone bars when said keys are actuated so as to rotate about said projections.

11. A toy musical instrument as defined in claim 10, wherein said arms project radially from said shaft and wherein said arms are spaced about said shaft so as to project from said shaft in different directions.

12. A toy musical instrument as defined in claim 10, including a projection attached to each of said arms at an extremity remote therefrom, each of said projections having an enlarged end thereon; and wherein each of said means attached to said arms comprises a ring positioned on one of said projections, said rings being held on said projections by said enlarged ends and being capable of rotation about said projections.

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13. A toy musical instrument as defined in claim 10, including: a resonating column mounted upon each of said keys, said resonating columns each having an open end located immediately adjacent to one of said tone bars.

Fig. 1

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14. A toy musical instrument as defined in claim 10, including: a plurality of resonating columns, each of said resonating columns being mounted on said housings immediately adjacent to said tone bars so that the spacing between said resonating columns and said tone bars are varied when said keys are actuated.

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15. A toy musical instrument which includes: a resiliently mounted support bar; means operatively associated with said support bar for vibrating said support bar; a plurality of resilient arms attached to said support bar so as to project therefrom; hammer means attached to the extremity of each of said resilient arms remote from said support bar; a sound generating element located adjacent to said hammer means so as to be spaced therefrom and so as not to be engaged by said hammer means when said support bar is vibrated causing said resilient arms and said hammer means to move; and key means for moving said sound generating elements towards said hammer means so that said sound generating element is engaged by said hammer means when said support bar is vibrated.

16. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses

receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside of said housing so as to be pushed into engagement with said key support ledge so as to rotate said keys about said projections; means extending upwards from each of said keys within said housing; resilient means located above each of said keys with respect to said means projecting upwards from said keys; a tone bar positioned upon said resilient means above each of said keys, each of said tone bars being loosely held against lateral movement by said means projecting upwards from each of said keys; resilient mounting means located within said housing, said resilient mounting means being attached to said housing so as to project into the interior thereof; a support bar attached to the ends of said resilient mounting means remote from said housing; means for vibrating said support bar located within said housing; a plurality of resilient arms attached to said support bar so as to project therefrom; and hammer means attached to the extremity of each of said resilient arms whereby each of said hammer means is designed to engage one of said tone bars when said keys are actuated so as to rotate about said projections.

17. A toy musical instrument as defined in claim 16, including: a resonating column mounted upon each of said keys, said resonating columns each having an open end located immediately adjacent to one of said tone bars.

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18. A toy musical instrument as defined in claim 16, including: a plurality of resonating columns, each of said resonating columns being mounted on said housings immediately adjacent to said tone bars so that the spacing between said resonating columns and said tone bars are varied when said keys are actuated.

Fig 1-4, 8

~~19. All of the features of novelty herein shown and described.~~

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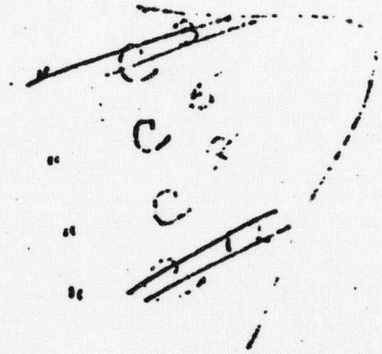

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OATH, POWER OF ATTORNEY, AND PETITION

Be[fore] duly sworn, I, Clair Omar Musser, depose and say that I am a citizen of the United States of America, residing at Studio City, California; that I have read the foregoing specification and claims and I verily believe that I am the original, first and sole inventor of the invention or discovery in TOY MUSICAL INSTRUMENTS described and claimed therein; that I do not know and do not believe that this invention was ever known or used before my invention or discovery thereof, or patented or described in any printed publication in any country before my invention or discovery thereof, or more than one year prior to this application, or in public use or on sale in the United States for more than one year prior to this application; that this invention or discovery has not been patented in any country foreign to the United States on an application filed by me or my legal representatives or assigns more than twelve months before this application; and that no application for patent on this invention or discovery has been filed by me or my representatives or assigns in any country foreign to the United States.

And I hereby appoint Edward D. O'Brian, Reg. No. 17,144, 541 South Spring Street, Los Angeles 13, California, my attorney with full power of substitution and revocation, to prosecute this application and transact all business in the Patent Office connected therewith.

Wherefore I pray that Letters Patent be granted to me for the invention or discovery described and claimed in the foregoing specification and claims, and I hereby subscribe my name to the foregoing specification and claims, oath, power of attorney, and this petition, this 16th day of January, 1962.

Inventor Clair Omar Musser

12957 Chalmwood Drive

Studio City, California.

STATE OF California }
COUNTY OF Los Angeles } ss:

Before me personally appeared Clair Omar Musser to me known to be the person described in the above application for patent, who signed the foregoing instrument in my presence, and who acknowledged to me that he executed the same therein as his free act and deed, on the day and year aforesaid.

Notary Public

My commission expires Feb. 4, 1963

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44/405

DIV. 5 561420

#2

FIG. 5.

FIG. 1.

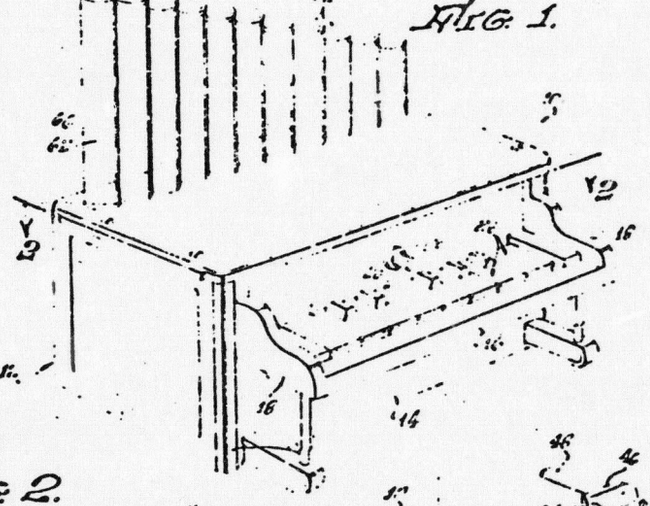
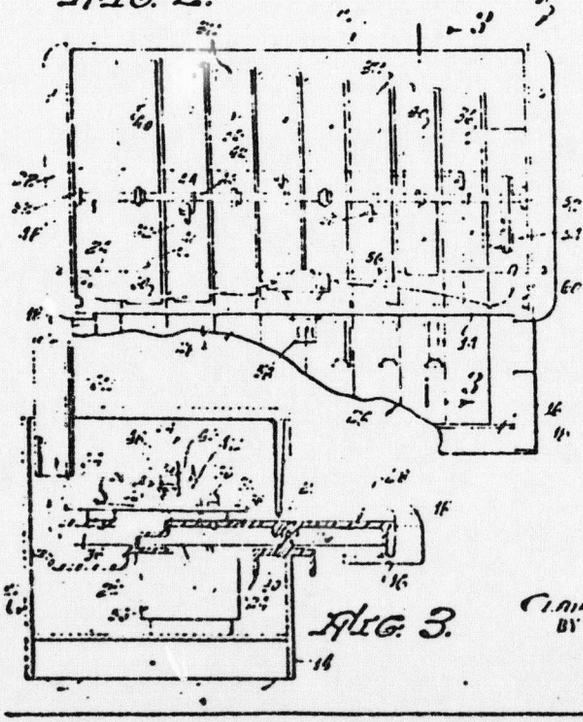


FIG. 2.



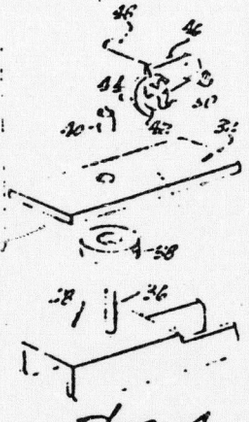


FIG. 4.

FIG. 3.

INVENTOR

CLAUDE OSMOND MILLIKEN

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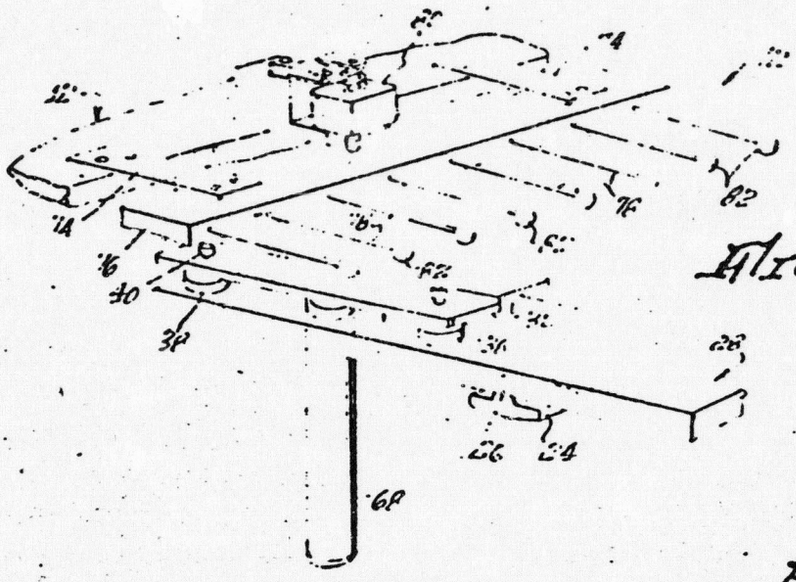


FIG. 6.

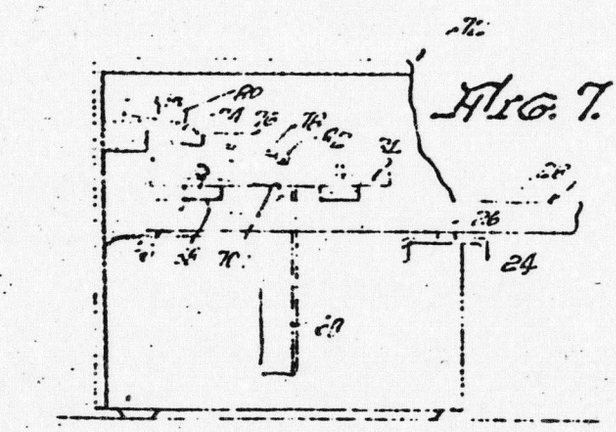


FIG. 7.

FIG. 9.

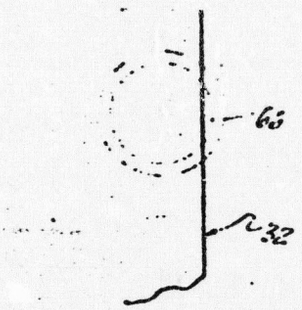


FIG. 8.

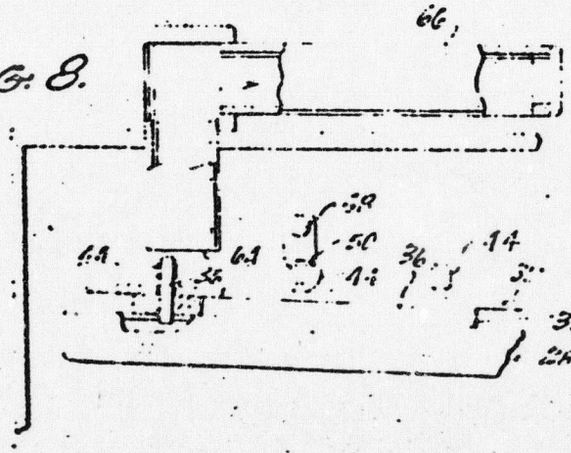
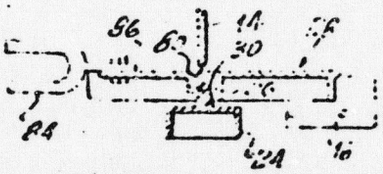


FIG. 10.



INVENTOR
CLAUDE OMAR MUSSER,
BY

ATTORNEY

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THE COMMISSIONER OF PATENTS
WASHINGTON 25, D. C.

DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

All communications regarding this application should give the serial number, date of filing, and name of the applicant.

PAPER NO. 3

Edward D. O'Brian
541 S. Spring St.
Los Angeles 13, Calif.

Applicant: Clair Omar Musser
Ser. No. 562,420
Filed January 26, 1956
For TOY MUSICAL INSTRUMENTS

MAILED
APR 13 1956
PAT. DIV. 51.

Please find below a communication from the EXAMINER in charge of this application.

Robert C. Watson
Commissioner of Patents.

This application has been examined.

References:

• Lohr	2,279,143	Apr. 7, 1942	84-404
Bienengraber (Germany)	567,657 (1 sht. dwg. 1 page spec.)	April 6, 1933	84-404

Of interest:

• Sjolander	2,508,300	June 6, 1950	84-257
• Fleury	2,510,094	June 6, 1950	84-404 xr

Claims 1 to 19 are now active in this application.

Claims 1 to 3 are rejected as being obviously fully met by Bienengraber.

Claim 4 is rejected as being obviously fully met by Lohr.

Claims 1 to 4 are considered to be generic.

This application contains claims specific to more than one of the disclosed species of the invention, namely the species of Figs. 3, 6, 8 and 10, respectively, and no allowable generic claim as indicated above. Since none of the generic claims have been allowed, applicant is required (1) to elect a single disclosed species even though this requirement be traversed and (2) to list all claims readable thereon, including any claims subsequently added. Section 809.02(a) Manual of Patent Examining Procedure.

Claim 19 is rejected as failing to "particularly point out and distinctly claim" as required by 35 U.S.C. 112.

No claim is allowed.

RCLucke/at

Examiner

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AMENDMENT

MAIL ROOM
OCT 1 1956
U.S. PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE

CLAIR OMAR MUSSER
SERIAL NO.: 561,420
FILED: JANUARY 26, 1956
FOR: TOY MUSICAL INSTRUMENTS

PATENT DIVISION 51

U. S. PATENT OFFICE
OCT 3 1956
DIVISION 51

AMENDMENT

Hon. Commissioner of Patents
Washington 25, D.C.
Dear Sir:

In response to the Patent Office action mailed April 13, 1956, please amend the above noted application as follows.

Cancel claims 8, 9 and 19.

REMARKS

In response to the above noted Patent Office action claims 8 and 9 and the non-statuatory claim 19 have been cancelled. The rejection of claims 1 and 3 on the basis of the German reference is respectfully transversed. Also the rejection of claim 4 on the Lohr patent is respectfully transversed.

It is considered that claims 1 - 5 of this application are generic to the complete inventive concept back of it. Specific note should be made of the fact that the independent claim 1 defines a toy musical instrument which includes a plurality of arms each carrying sound generating elements. The dependent claims 2 and 3 define sound reinforcing structures

or resonating columns and means for moving the structures used in claim 1 for actuating the sound generating elements, respectively. Claim 4 is of a similar scope to claim 1 but defines in more detail a structure in which a sound generating element or tone bar is mounted upon a key so as to be rotated when the key is actuated into a position where it is engaged by various means as illustrated and described. Claim 5 is similar to claim 4 but defines more structure than is found in claim 4 by setting forth resonating columns. It will be realized therefore that all of these first five claims in the application are generic to the entire concept of the invention.

The question is whether this concept is anticipated by the references. The German patent cited by the Examiner is unquestionably pertinent to the entire concept of the invention employed. However, this reference does not really anticipate the claims in this case because of the fact that the keys employed to operate this reference structure do not carry the tone bars employed. In effect, a rather involved system of linkages, etc., is required to move the tone bars in this reference against the small rings in the center of it used to actuate these tone bars. Such a linkage is obviously complicated. Further, it necessitates a comparatively large structure of an involved category. The structure of the reference is not considered to be a simple structure which can easily be turned out on a mass production basis in a modern toy factory.

The structures defined in all of the claims in this case are specifically designed for mass production in the toy field. Specifically the keys can be assembled with tone

bars on them by subassembly procedures; then they can be merely dropped into place as shown in Fig. 3 of the drawings. No adjustment of linkages is required; no problem of friction of the connections between bars of a linkage is involved; and further, no unnecessary oiling of various joints between links can possibly be involved with this structure. The undersigned has personally played with one of the toy pianos of this invention and has found it extremely simple and interesting to work with. He is thoroughy convinced that the German references does not show the structures set forth in claims 1 - 3.

Neither does the Lohr patent show the structure. This is considered obvious from an examination of Fig. 3 of the drawings of this reference. Here the tone bar is shown above a hammer 54 mounted on the end of the key. When the key is actuated the hammer hits the tone bar. Obviously the tone bar is not mounted on the key in this type of structure and no means are indicated in it whereby various tremolo type effects can be achieved with this reference, by periodic hitting of the tone bars. Further, it is considered impossible to modify the Lohr structure to achieve such effects, unless it is completely redesigned as taught in this application.

In view of the fact that the Examiner has not specifically cited either the Fleury or Sjolander patents against this application, it is not considered necessary to specifically discuss them. The first of these references merely shows a fixed vibrating reed type of structure. The second shows a peculiar type of stringed musical instrument.

In order that this amendment may be complete under the Rules of Practice of the U. S. Patent Office, the

Applicant elects the species of the invention utilizing the means for actuating the tone bars shown in Fig. 3 of the drawing. Applicant also elects the species of the invention shown in Fig. 6 of the drawing pertaining to the mounting of a resonating column directly beneath a tone bar so that this column is moved as the tone bar itself is moved. It is considered that claims 7, 10, 11, 12, 13 and 14 are directed to the elected species. The Examiner will realize it is believed that there are two different classes of species involved here. One of these classes is the species of actuating the tone bars, and the other is the class of species pertaining to the position of the resonating columns employed.

In view of the above comments it is respectfully requested that the requirement for election of species be reconsidered since the generic claims are considered to be allowable over the reference of record.

Respectfully submitted,

Edward D. O'Brian

September 21, 1956

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U. S. DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

All communications respecting this application should give the serial number, date of filing and name of the applicant.

PAPER NO. 5

Edward D. O'Brian
541 S. Spring St.
Los Angeles 13, Calif.

Applicant: Clair Omar Musser	
Ser. No. 561,420	MAILED
Filed January 26, 1956	JUL 17 1957
For TOY MUSICAL INSTRUMENTS	PAT OFF DIV 5

Please find below a communication from the EXAMINER in charge of this application.

Robert C. Watson
Commissioner of Patents.

Responsive to amendment filed October 1, 1956.

Additional reference applied:

Deagan 1,293,722 Feb. 11, 1919 84-410

In the specification page 7, line 7, reference character "34" should be applied to the drawing.

Claims 1-4 are rejected as being aggregative in form in that these claims set forth applicant's invention in terms of "means" followed by a statement of function without setting forth the structural relationship between the "means" and any other element recited in each of these claims.

For example, the "means" recited in line 6 of claim 1, line 2 of claim 3 and line 8 of claim 4 has not been structurally related to any other element recited in each of these claims. In re Hall, 614 O.G. 11; 1948 C.D. 534.

Claim 1 is further rejected as being unpatentable over the disclosure of German patent 567,657, of record.

It is held that this claim is readable in terms at least, upon the structure disclosed by the German patent. The

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German patent discloses a musical instrument which has a support member, a plurality of movable arms 1 mounted on said support member, a sound generating element f mounted on each of the arms so as to be movable therewith and means d for actuating the sound generating elements mounted on said support member adjacent said arms so when said arms are moved, said sound generating elements are actuated by the means d.

Claims 2-5 and 7 are rejected as being unpatentable over the disclosure of German patent 567,657 in view of the disclosure of the patent to Deagan, above cited.

It is held that it would not involve invention to provide the musical instrument of the German patent with a sound resonator adjacent each of the sounding bars f in view of the clear disclosure of the patent to Deagan who shows that resonators 2 may be mounted adjacent each of the sound bars 1. The particular location of the resonators relative to the sound bars is held to be merely a matter of choice or design which does not involve invention.

Claims 13 and 18 are rejected as being vague, indefinite, and incapable of being construed in that these claims are not readable upon a single figure of the drawing. For example, claim 13 is dependent from claim 10 which recites the rotatable shaft as a means for exciting the sound bars which is readable upon the form of applicant's device illustrated by Figs. 1-4 whereas claim 13 recites the resonating columns as being mounted on each of the keys which is readable on the form of applicant's device illustrated by Figs. 7 and 9. A claim should be readable upon a single figure of the drawing. Ex parte Wadsworth, 1923 C.D. 48; 317 O.G. 231 and Ex parte Welch, 1900 C.D. 190; 93 O.G. 2104.

Claims 1-5 and 7 are rejected.

Claims 8, 9 and 19 are cancelled. Claims 6 and 15-18

are held to be withdrawn from further consideration under Rule 142(b) as not readable on the elected species.

Claims 10-12 and 14 appear to contain allowable subject matter as at present advised.

C W Robinson

Examiner

LWJohnston:mac

JAN 15 1958

IN THE UNITED STATES PATENT OFFICE JAN 20 1958

CLAIR OMAR MUSSER :

SERIAL NO.: 561,420 :

FILED: JANUARY 26, 1956 :

FOR: TOY MUSICAL INSTRUMENTS:

DIVISION 5

A M E N D M E N T

Hon. Commissioner of Patents

Washington 25, D.C.

Dear Sir:

In response to the Patent Office action mailed July 17, 1957 please amend the above noted application as follows:

Page 9, lines 10 and 11, both occurrences, change "treble" to -tremulo-;

Claim 10, line 33, cancel the word "key";

Rewrite claims 1 - 7 inclusive as the following new claims:

20. A toy musical instrument which includes: a housing; a plurality of keys rotatably mounted on said housing, each of said keys extending from said housing; a sound generating element resiliently mounted on each of said keys within said housing so as to be capable of movement therewith; a member for hitting a sound generating element so as to periodically engage the same, movably mounted within said housing adjacent to each of said

sound generating elements; means for moving said members mounted within said housing so that said sound generating elements are periodically engaged by said members when said keys are rotated in order to produce tremulous sound.

21. A toy musical instrument as defined in claim 20 including a resonating column mounted on each of said keys adjacent to each of said sound generating elements.

22. A toy musical instrument as defined in claim 20 including a resonating column mounted on said housing adjacent to each of said sound generating elements so that the spacing between said columns and said sound generating elements is varied when said keys are rotated.

23. A toy musical instrument which includes: a support member having a projection extending therefrom; a key having a recess located in the bottom thereof positioned so that said recess is engaged by said projection, said key being capable of being rotated about said projection; a sound generating element mounted on said key so as to be movable therewith; a member for hitting said sound generating element, said member being located adjacent to said sound generating element so that when said key is rotated about said projection, said sound generating element is moved into engagement with said member, causing sound to be produced.

24. A toy musical instrument as defined in claim 23 including a resonating column mounted on each of said keys adjacent to each of said sound generating elements.

25. A toy musical instrument as defined in claim 23 including a resonating column mounted on said housing adjacent to each of said sound generating elements so that the spacing between said sound generating elements is varied when said keys are rotated.

Add the following new claims.

26. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside of said housing so as to be pushed into engagement with said key support ledge so as to rotate said keys about said projections; a tone bar resiliently mounted on each of said keys; a member for hitting each of said tone bars so as to actuate the same mounted above each of said tone bars within said housing.

27. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located thereon; a key support ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; ~~a support member positioned within said housing so as to project upwards from the lower edge thereof;~~ a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside of said housing so as to be pushed into engagement with said key support ledge so as to rotate said keys about said projections; a tone bar resiliently attached to each of said keys; a member for hitting a tone bar so as to actuate the same movably mounted inside said housing adjacent to each of said tone bars; and means for moving said members so that said tone bars are engaged by said members when said keys are actuated so as to rotate about said projections, said means for moving being mounted within said housing.

28. A toy musical instrument of the class described which includes: a housing having a front side

formed with an elongated slot located therein; a key support edge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside of said housing so as to be pushed into engagement with said key support edge so as to rotate said keys about said projections; a tone bar resiliently attached to each of said keys; a shaft rotatably mounted within said housing above said tone bars, said shaft being generally parallel to said slot; means mounted in said housing for rotating said shaft; a plurality of arms attached to said shaft so as to project therefrom, each of said arms being located generally above one of said tone bars; means attached to each of said arms for periodically striking one of said tone bars when said keys are actuated so as to rotate about said projections.

29. A toy musical instrument as defined in claim 28 wherein said arms project radially from said shaft and wherein said arms are spaced about said shaft so as to project from said shaft in different directions.

30. A toy musical instrument as defined in claim 28, including a projection attached to each of said arms at an extremity remote therefrom, each of said projections having an enlarged end thereon; and wherein each of said means attached to said arms comprises a ring positioned on one of said projections, said rings being held on said projections by said enlarged ends and being capable of rotation about said projections.

31. A toy musical instrument as defined in claim 28, including: a resonating column mounted upon each of said keys, said resonating columns each having an open end located immediately adjacent to one of said tone bars.

32. A toy musical instrument as defined in claim 28, including: a plurality of resonating columns, each of said resonating columns being mounted on said housing immediately adjacent to said tone bars so that the spacing between said resonating columns and said tone bars are varied when said keys are actuated.

R E M A R K S

In response to the above noted Patent Office action claims 1 - 7 inclusive have been permitted as claims 20 - 25 inclusive. In addition claims 26, 27, and 28 which are patterned after the allowed claim 20 have been inserted. Also claims 29, 30, 31, and 32 which are identical in subject matter to claims 11, 12, 13, and 14 respectively have been added. These latter claims are all dependent upon claim 28.

Also, in the specification on page 9 the word "treble" initially used has been replaced with the term "tremulo". Upon consulting an unabridged dictionary it appeared that

the term "treble" was obviously in error and that the correct term to be used was "tremulo". This term "tremulo" forms the basis of the term "tremulous" employed in the new claim 20. Also in the allowed claim 10, line 33, the word "key" has been cancelled as being inserted erroneously. It is believed that the Examiner will understand this minor change in claim 10 from an examination of it. The subject matter of claim 10 is definitely not changed in any respect.

The new claims 20 - 25 are considered to be written in such a manner as to avoid the formal objection to claims 1 - 4 inclusive. All of these new claims are considered to set forth positively the structure defined in them in such a way that there is no question but that specific elements and not function are defined.

The new claim 20 is primarily patterned after claim 1. In it a structure is specified in which a plurality of keys are rotatably mounted and in which the sound generating elements employed are attached or mounted upon these keys so that when the keys themselves are rotated the sound generating elements are engaged so as to produce a tremulous sound. In claim 20 the members for hitting the sound generating element are specifically spelled out and the means for moving these members are specifically defined. Claim 21 is dependent upon claim 20 and directed to the resonating columns being mounted on each of the keys specified. Claim 22 is also dependent upon claim 20 and defines the resonating columns being mounted on the housing adjacent to the sound generating elements employed. The Degan patent is not considered to anticipate these combination claims since in Degan resonating columns are

mounted in a fixed location with respect to rigid tone bars.

The new claim 23 is similar to claim 20 and to claim 4. It specifies the use of a key structure having a recess located in the bottom of it so that the keys may be easily located by merely dropping them over the projections upon a support member. Further, this claim defines the type of structure indicated in claim 20 in which a sound generating element, such as a tone bar, is mounted upon a key so that when the key is rotated this sound generating element is brought into engagement with a member serving to actuate it. Claims 24 and 25 are substantially identical to claims 21 and 22, respectively, but are dependent upon claim 23.

The new claims 20 and 23 added above are considered to be generic to all aspects of the present invention. They are not considered to be anticipated by the German patent of record for several reasons. In the German patent the key structures employed are completely separate and apart from the sound generating elements utilized. The keys and these sound generating elements are connected by a series of linkages, etc. This is a comparatively complex structure as opposed to the very simple type of key structure carrying sound generating elements defined in claims 20 and 23.

It is believed that the Examiner will realize the simplicity and desirability of the key-type structure used with this invention from a careful comparison of the drawing in this case with the drawing in the German patent. The key-type structure of the present invention is specifically adapted to mass production techniques such as are employed

with toys. The individual tone bars can easily and conveniently be mounted upon these keys and an entire key and tone bar assembly can be easily dropped or similarly inserted in place within a complete toy musical instrument with a minimum of difficulty.

In spite of the comparative simplicity of the structure of the present invention, it is surprising the quality of toy musical instruments constructed in accordance with this disclosure. It is considered by the undersigned that these toys are actually of better quality than some professional instruments of a similar nature. Toy musical instruments as defined in the claims of this application have been widely sold at the present time, and have been used in a number of programs, such as, for example, the Perry Como Television Show. The fact that a high quality toy such as is involved with the present invention can be easily and cheaply manufactured on a mass production basis is considered to be an element which should be considered in his evaluating the claims in this case.

The new claim 26 added above is patterned after the allowed claim 10 and is identical to the allowed claim 10 through the semi-colon in line 20 in this claim; in the last part of claim 26, however, the language of claim 10 has been simplified considerably by merely specifying that the tone bars are resiliently mounted on the key. Also new claim 27 specifies in broad terms the use of a member for hitting the tone bars so as to actuate the same when the keys are rotated. Thus, the new claim 26 contains much of the subject matter of the allowed claim 10. It is considered patentable over the German reference

cited by the Examiner because of the simplicity of the key and tone bar structure defined in it. As pointed out in the preceding discussion, a relatively complex type of mechanism is employed in the German reference so as to link the keys with the sound generating elements employed.

The new claim 27 is also patterned after the allowed claim 10 and is identical with the allowed claim 10 down through the semi-colon in line 20 of this claim. The new claim 27 defines the fact that the tone bars are resiliently mounted on each of the keys in a comparatively simple manner. Also the new claim 27 specifies the use of members for hitting these keys mounted within the housing and means for moving the members for hitting the keys so that a tremulous type of sound is produced. Comparatively broad terminology is utilized in defining these members and the means for moving them. The terminology in claim 27 is similar to the terminology employed in claim 20. This new claim 27 is considered to be patentable for the reasons indicated in the preceding in discussing the German patent.

The new claim 28 is also patterned after the allowed claim 10 and is identical with the allowed claim 10 except for the fact that the clause starting with the words, "means extending" in line 20 of this claim and continuing down to "said keys" in line 27 of claim 10 has been replaced with a simple recitation that the individual tone bars are resiliently mounted on each of the keys. The new claim 28 is considered to be allowable over the German references for all the reasons which must have been considered by the Examiner in allowing claim 10.

The new claims 29, 30, 31, and 32 are identical to claims 11, 12, 13, and 14 respectively, present in this application except for the fact that they are dependent upon claim 28. Since claims 11, 12, and 14 have been allowed, it is considered that there should be no question to the matter of allowability of claims 29, 30 and 32.

The rejections of claims 13 and 15 in this application is also considered to be applicable to the new claim 31 presented above. This rejection of claims 13 and 15 is considered to be a result of difficulties with certain formal practices of the Patent Office with respect to election of species. Frankly, the undersigned is somewhat puzzled as to the most convenient method for handling this difficulty.

In the preceding amendment an election was made of the means for actuating the tone bars shown in Fig. 3 of the drawing and the species of resonating columns shown in Fig. 6 of the drawing. In the paragraph starting at the bottom of page 10 of the specification in this case, it is clearly indicated that the type of resonating column and key structure shown in Fig. 6 of the drawing can be employed instead of the resonating column structure shown infig. 1 of the drawing. Thus, it was indicated that two types or species of resonating columns shown could be interchanged with one another. Further, in this application two different species of actuating means are employed. The first of these the type of shaft construction shown in Figs. 1, 2, and 3 and the second is the vibrating typeof structure shown in Figs. 5 and 7.

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The type of election of species made in this application was made primarily because of commercial reasons. The commercial embodiment of the toymusical instruments set forth in this application corresponds directly to the election of species made. Thus, commercial toy musical instruments of the type defined in this application employ a rotating shaft and have resonating columns mounted upon the keys. At the time the election of species was made it was considered in view of a clear disclosure in this case that an additional sheet of drawings could be added showing the precise commercial structure. However, it was considered that this would be an unnecessary move since all the elements which would be found on such an additional sheet of drawings were already clearly indicated in this application. If necessary an extra sheet of drawings can still be inserted showing precisly what has been elected; however, it is believed that this expedient is unnecessary.

Claims 20, 23, 26 and 27 presented in this application are considered to be of a true generic category inasmuch as they are generic to the species of resonating columns shown in the drawing and to both of the species of actuating means or members shown in the drawings. Dependent claims 21 and 24 are directed to the elected resonating column species, while the dependent claims 22 and 25 are directed to the non-elected species of resonating columns. These claims depend upon generic claims 20 and 23, respectively.

It is considered that the allowed claim 10 is subgeneric in category inasmuch as it is directed to the elected species of tone bar actuators shown in Figs. 1, 2,

and 3 of the drawings and inasmuch as it is generic to both of the types of resonating column structures in this case. Claim 28 which is closely patterned after claim 10 is also considered to be subgeneric in category for the same reasons. The dependent claims 11, 12, 29 and 30 are further considered to be subgeneric and directed to the elected species of means for actuating the tone bars since they merely add to the structure defined in the independent claims 10 and 28 specific details as to the type of actuator structure defined. Claims 13 and 31 are dependent upon claims 10 and 28 respectively; these claims are directed to the elected species of resonating columns and are dependent to the subgeneric claims defining the elected species of actuating the tone bars. Claims 14 and 32 are also dependent upon the same subgeneric claims 10 and 28. These claims do not, however, relate to the type of resonating column structure elected by the Applicant. The problem with respect to them is considered to be more complex since claim 14 directed to a non-elected species has been allowed.

Claims 15 and 16 in this application are considered to be subgeneric to the entire concept of the invention and to be directed to the non-elected species of actuating means. Claim 17 is directed to the elected resonating column of species and claim 18 is directed to the non-elected column species. Both of these claims are dependent upon the subgeneric claim 16. Hence it is believed that claims 17 and 18 are withdrawn from further prosecution pending the allowance of a truly generic claim such as claim 20, 23, 26 or 27 at which time all of claims 15, 16, 17, and 18 will be open for consideration by the Patent Office.

It is believed that upon reconsideration the Examiner will consider the allowed claims 10, 11 and 12 to be of a subgeneric category and will hold that it is possible to have species under the subgeneric claims as indicated. In considering this matter, the undersigned consulted the Manual and McCrady on Patent Office Practice (3rd. Edition) in order to determine if there was any discussion in either of these references which would clarify the situation. No clear definition was seen in the Manual with respect to the term "subgeneric claim" and with respect to whether or not a subgeneric claim could be used where there is a plurality of different sets of species which could be used with one another as in this application.

It is noted, however, that although the Manual does not specifically mention subgeneric claims with respect to the discussion on restriction, a discussion of the subject matter is found in Section 706.03(y) pertaining to Markush groups in chemical cases. In a chemical case it is possible to present a truly generic claim and to also present at the same time subgeneric claims and various species claims under these subgeneric claims. The situation involved here is analogous to chemical practice involving subgeneric Markush claims. In such chemical cases specific species claims can be allowed under completely generic claims, such as for example, the generic claims 20 and 23. The claims 21, 22, 24 and 25 are considered to be such species claims under completely generic claims. Further, in chemical practice species claims can be allowed under subgeneric Markush claims. It is considered that claims 10, 11, 12, 15, 16, 28, 29 and 30 in this application

are at least the equivalent of subgeneric Markush claims and that it is proper to have species claims such as the claims 13 and 14, 17 and 18 and 31 and 32 under these subgeneric claims.

In response to this amendment an early and favorable consideration by the U.S.Patent Office is solicited. The undersigned considers that the claims in this application clearly define what is a patentable invention over the references of record. In the event that the Examiner is unwilling to accept the analysis with respect to the generic and species claims indicated above, he is respectively requested to indicate what procedure would be acceptable in order to enable the Applicant to obtain claims directly covering the commercial embodiment of this invention.

Respectfully submitted,

Edward D. O'Brien

January 13,1958

(1)

MAIL ROOM MAY 14 1958 U.S. PATENT OFFICE

Mr Belcher 2

U. S. PATENT OFFICE

MAY 15 1958

LAW EXAMINER

IN THE UNITED STATES PATENT OFFICE

CLAIR OMAR MUSSER	:
SERIAL NO.: 561,420	:
FILED: JANUARY 26, 1956	:
FOR: TOY MUSICAL INSTRUMENTS:	

DIVISION 5

RECEIVED

MAY 23 1958

DIVISION 5 PAPER NO. 7

Petition to make special & affidavits

PETITION TO MAKE SPECIAL

Hon. Commissioner of Patents

Washington 25, D.C.

Dear Sir:

You are hereby petitioned to make the prosecution of the above noted patent application special before the United StatesPatent Office. This petition is based upon the infringement of the subject matter of the above noted patent application by Spear Products, Inc. of Bridgeport, Connecticut. Toy musical instruments produced by this firm have been observed by the undersigned in a large toy establishment in Los Angeles, California.

In support of this petition an affidavit is enclosed herewith by Mr. Clair Omar Musser indicating when knowledge of the infringing device was received by himself and by employees at the Knickerbocker Plastics Company, Inc. Also a supporting affidavit by the undersigned indicating

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that he has examined the infringing device and that he considered it to be an infringement of some of the claims of this application and that a careful and thorough search had been made, and that most pertinent references against this application are of record and that he believes all claims in this case to be patentable is enclosed herewith.

It is considered unnecessary to go into the subject matter of these affidavits in more detail in view of the fact that they are considered self-explanatory.

It is noted that this petition to make special is being mailed to the Patent Office approximately one week after knowledge that there might be an infringing device actually on the market was received. It is considered under the circumstances involved here that more rapid action on the part of the Applicant and his attorney is impossible.

An interview with respect to the above noted patent application was held approximately two months ago. Because of certain problems pertaining to the production of an additional sheet of drawing to submit to the Patent Office a responsive amendment has not yet been filed after this interview. Such an amendment will be filed this week. All reasonably possible steps to expedite the drawing in this case are being taken at the present time. The application itself is now under amendment.

Respectfully submitted,

Edward D. O'Brian

May 12, 1958

MAIL ROOM
MAY 14 1958
U.S. PATENT OFFICE

RECEIVED
MAY 23 1958
DIVISION 5 PAPER NO. 7

IN THE UNITED STATES PATENT OFFICE

CLAIR OMAR MUSSER :
SERIAL NO.: 561,420 : DIVISION 5
FILED: JANUARY 26, 1956 :
FOR: TOY MUSICAL INSTRUMENTS:

A F F I D A V I T

STATE OF CALIFORNIA)
COUNTY OF LOS ANGELES) SS:

Being duly sworn, I, CLAIR OMAR MUSSER, depose and say:

1. I am the inventor named in the above noted patent application. In addition I am employed by the Knickerbocker Plastics Company, Inc. of North Hollywood, California, which firm is presently engaged in and has been engaged in the manufacture of toy musical instruments as defined in the above noted patent application. My duties for Knickerbocker Plastic Company, Inc. involve all patent and related matters pertaining to the products of this firm.

2. On Monday, May 5, 1958 I was informed that a toy musical instrument such as is set forth in the above noted patent application was being manufactured and sold in the United States by a firm other than Knickerbocker Plastics Company, Inc., and that a sample of this other toy musical instrument was on sale in a toy house or sales firm in Los Angeles, California. As soon as possible after this

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date efforts were made to inspect this other toy musical instrument.

3. On Friday, May 9, 1958, I was able to inspect the working parts of the other toy musical instrument identified in paragraph 2 above. This other musical instrument bore a label indicating that it was manufactured by Spear Products, Inc. of Bridgeport, Connecticut. This toy musical instrument produced by Spear appeared to me to utilize the essential working parts of the toy musical instrument identified in the above noted patent application.

Subscribed and sworn to before me this 12 day of May, 1958.

Caroline H. Rehm
Notary Public

May 12, 1958

My Commission Expires July 25, 1960

MAIL ROOM
MAY
14
1958
U.S. PATENT OFFICE

RECEIVED
MAY 23 1958
DIVISION 5 PAPER NO. 7

IN THE UNITED STATES PATENT OFFICE

CLAIR OMAR MUSSER :
SERIAL NO.: 561,420 :
FILED: JANUARY 26, 1956 : DIVISION 5
FOR: TOY MUSICAL INSTRUMENTS:

AFFIDAVIT

STATE OF CALIFORNIA }
COUNTY OF LOS ANGELES } SS:

Being duly sworn I, EDWARD D. O'BRIAN, depose and say:

1. I am the attorney of record handling the prosecution of the above noted patent application before the United States Patent Office.

2. I was scheduled to see Mr. Clair Omar Musser of the Knickerbocker Plastics Company, Inc. of North Hollywood, California, early in the week commencing Monday, May 5, 1958. Because of certain unforseen eventualities I was unable to meet with Mr. Musser until Thursday, May 8, 1958. At this time Mr. Musser informed me of the existence of a toy musical instrument which was more than similar to the toy musical instrument described in the above noted patent application. Arrangements were made at this time for me to examine this infringing device early the following morning on Friday, May 9, 1958.

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3. On Friday, May 9, 1958, I met with Mr. Musser and entered a large toy establishment in Los Angeles, California. While there I examined a toy musical instrument bearing a label indicating that it had been manufactured by Spear Products, Inc. of Bridgeport, Connecticut in detail.

4. In my opinion this toy musical instrument manufactured by Spear Products, Inc. unquestionably uses certain of the essential features and mechanisms set forth in the above noted patent application. In my opinion some claims of this patent application are unquestionably infringed by this musical instrument produced by the Spear Products, Inc.

5. In the past I personally made a careful and thorough search of an exhaustive category with respect to the prior art pertaining to the subject matter of the above noted patent application. In addition presumably the U. S. Patent Office has made a careful and thorough search with respect to the subject matter of this patent application in acting upon this application and indicating claims in it to be allowable.

6. I believe and consider that all of the claims in the aforenoted patent application are clearly patentable and that the most pertinent references against the issue of a patent on this application are of record in this application.

Robert D. O'Brien

Subscribed and sworn to before me this 12 day of May, 1958.

Caroline H. Lehn

SEAL

My Commission Expires July 25, 1960

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PO-172 –

Report requested 5/16/58

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON 25, D. C.

U. S. DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

RECEIVED
MAY 19 1958

DIVISION 5 PAPER NO.

Ex parte: Clair Omar Musser
Serial No.: 561,420
Division: 5

3722

The examiner will please send the file of this application to Arthur H. Behrens, Room 1318 indicating hereon when the application will be reached for action. If an amendment or other paper is attached, it should be entered before the file is forwarded.

Robert C. Watson
Commissioner

5/20/58

This application will be acted upon on or about Oct. 15, 1958, in regular order.

5-20-58
Date of Report

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Gertrude Hemmerich
Signature of person reporting

POL-181

U.S. DEPARTMENT OF COMMERCE
UNITED STATES PATENT OFFICE
WASHINGTON

May 22, 1958

Ex parte Clair Omar Musser
Serial No. 561,420
Filed January 26, 1956
For: Toy Musical Instruments

Petition to Make Special

The petition to make this case special has been considered.

If the examiner can make this case special without prejudice to any possible interfering applications, and he should make a rigid search for such, he is authorized to do so for the next action. Should the application be rejected, the case will not be considered special for the subsequent action unless the applicant promptly makes a bona fide effort to place the case in condition for allowance even if it is necessary to have an interview with the examiner to accomplish this purpose.

If the examiner finds any interfering application for the same subject matter, he should consider such application simultaneously with this case and should state in the official letter of such application that he is taking it out of its turn because of a possible interference.

Should an appeal be taken in this case or should this case become involved in interference, consideration of the appeal and the interference will be expedited by all Patent Office officials concerned, contingent likewise upon diligent prosecution by the applicant.

The petition is granted to the extent indicated.

Arthur W. Crocker
First Assistant Commissioner

Edward D. O'Brian
541 S. Spring St.
Los Angeles 13, Calif.

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MAIL DIVISION
MAY 19 1956
U.S. PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE

CLAIR OMAR MUSSER :
SERIAL NO.: 561,420 :
FILED: JANUARY 26, 1956 :
FOR: TOY MUSICAL INSTRUMENTS:

SUPPLEMENTAL AMENDMENT

Hon. Commissioner of Patents
Washington 25, D.C.

Sir:

Please amend the above noted patent application as follows:

In the specification:

Page 3, line 26, cancel the word "and";

Page 4, line 2, change the period to a semi-colon and insert the following paragraphs between lines 2 and 3:

Fig. 11 is a view similar to Fig. 2 of a further modified toy musical instrument of this invention; and

Fig. 12 is a cross-sectional view taken at line 12-12 of Fig. 11.

Page 11, between lines 4 and 5, insert the following new paragraph:

This type of construction is indicated in Figs. 11 and 12 of the drawing. Here there is shown a toy musical instrument 71 in which each of the keys 28 carries a resonating column 68 located so as to have an open end positioned immediately adjacent to the tone bar 32 attached to each of these keys. With this instrument 71 the identical actuating structure incorporating a shaft 48, arms 46, rings 42 and a motor 56 previously described as above is used. It is noted that with this modified instrument the resonating columns 62 shown in Fig. 3 is omitted.

Add the following new claim.

33. A toy musical instrument as defined in claim 10 including a resonating column mounted adjacent to each of said tone bars, each of said resonating columns having an open end located immediately adjacent to one of said tone bars;

Rewrite claim 13 as the following claim:

34. A toy musical instrument as defined in claim 33 wherein each of said resonating columns is mounted upon one of said keys;

Rewrite claim 14 as the following new claim:

35. A toy musical instrument as defined in claim 33 wherein said resonating columns are mounted on said housing;

Claim 15, line 2, after the word "means" insert -operatively associated with said support bar-; line 11, after "and" insert -key-; after "means" insert -operatively associated with said sound generating elements-; change

"element" to -elements-;

Add the following new claim:

36. A toy musical instrument as defined in claim 16 including a resonating column mounted adjacent to each of said tone bars, each of said resonating columns having an open end located immediately adjacent to one of said tone bars;

Rewrite claim 17 as the following new claim:

37. A toy musical instrument as defined in claim 36 wherein each of said resonating columns is mounted upon one of said keys;

Rewrite claim 18 as the following new claim:

38. A toy musical instrument as defined in claim 36 wherein said resonating columns are mounted on said housing;

Claim 20, line 3, after the word "housing" 1st occurrence insert -, each of said keys having a normal position and being capable of being rotated to a playing position-; line 4, change "mounted on" to -attached to-; line 6, change "therewith" to -from a normal position to a playing position-; line 9, after the word "means" insert -operatively associated with said members and mounted in housing-; line 12, after "rotated" insert -to said playing position-; line 13, after the word "sound" insert -said sound generating elements being spaced from said members in said normal position-;

Add the new claim 39:

39. A toy musical instrument as defined in claim 20 including a resonating column mounted adjacent to each

of said tone bars, each of said resonating columns having an open end located immediately adjacent to one of said tone bars;

C 4 cont'd

Rewrite claim 21 as the following new claim:

40. A toy musical instrument as defined in claim 39 wherein each of said resonating columns is mounted upon one of said keys.

Rewrite claim 22 as the following new claim:

41. A toy musical instrument as defined in claim 39 wherein said resonating columns are mounted on said housing.

Cancel claims 23, 24, 25, and 26;

Claim 27, line 21, after the word "projections" insert, -to a playing position-; line 21, change "mounted" to -attached to-; line 22, cancel "on"; after the word "keys" insert, -so as to be moved to a playing position when said keys are moved to a playing position-; line 24, after "means" insert -operatively associated with said members and mounted in said housing-; line 25, after "are" insert, -peridoically-; lines 27 and 28, cancel the clause starting "said means....within said housing" and insert -to a playing position-;

C 4

C 10

Claim 28, line 20, after the word "projections" insert -to a playing position-; line 20, change "mounted on" to -attached to; line 21, cancel "above each of said keys" and insert -, so as to be moved to a playing position when said keys are moved to a playing position-; line 23, after the word "means" insert -operatively associated with said

C 11

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shaft and-; line 27, change "attached to" to -operatively associated with-; line 27 after the word "for" insert -periodically-; line 29, after the word "projections" insert -to a playing position;

Add the following new claim 42:

42. A toy musical instrument as defined in claim 28 including a resonating column mounted adjacent to each of said tone bars, each of said resonating columns having an open end located immediately adjacent to one of said tone bars;

Rewrite claim 31 as the new claim 43:

43. A toy musical instrument as defined in claim 42 wherein each of said resonating columns is mounted upon one of said keys;

Rewrite claim 32 as the following new claim 44:

44. A toy musical instrument as defined in claim 42 wherein said resonating columns are mounted on said housing.

R E M A R K S

The Assistant Examiner handling this patent application is respectfully thanked for the courteous interview accorded the undersigned approximately a month and a half or two months ago. Because of trouble of the undersigned pertaining to obtaining the services of a suitable patent draftsman this amendment has been delayed.

At the interview the problems poised in this application by the election of species and the Patent Office allowing the non-elected claim 14 were discussed in some detail. In order to overcome this difficulty, two things

have been done. One of these is that the specification has been amended above so as to describe new Figs. 11 and 12 showing a structure corresponding to the elected species. A composite sketch showing parts of Figs. 1, 3 and 7 of the drawings initially submitted in this application and superimposing certain parts of these figures on one another with changes as indicated in red is attached to this amendment. A new sheet of drawings is on order from the draftsman of the undersigned.

A new sheet of drawings corresponding to the sketch is enclosed herewith is thus being prepared and will be filed in the Patent Office as soon as possible. The sketch shows that the new sheet of drawings will correspond directly to the elected species of actuating means and the elected of species of resonating columns. If the Examiner wishes to refer to the nature of the election made in this application reference is made to the statements appearing at the top of page 4 of the amendment signed September 21, 1956. This election was made in order to correspond to the commercial toy musical instrument which is being produced.

In order to overcome the difficulties poised by the problems of the election of species and certain of the Patent Office rules a new claim 33 has been added which is dependent upon the allowed claim 10 defining the use of a resonating column broadly adjacent to each of the tone bars. Claim 13 covering the elected resonating column species and which was rejected as pertaining to the non-elected species and the allowed claim 14 have been rewritten so as to be dependent upon this new claim 33.

Because of the insertion of this new claim 33 certain minor changes in wording were necessary in rewriting claims 13 and 14 as new claims 34 and 35. It is considered that the subject matter of these claims has not been changed.

In order to clear up other difficulties of a similar nature claims 17 and 18 which were dependent upon claim 16 have been rewritten and a new set of claims 36, 37 and 38 which are identical in wording to claim 33, 34 and 35, respectively have been inserted so as to be dependent upon claim 16. In a similar manner claims 21 and 22 have been rewritten and in their place a new set of claims 39, 40 and 41 have been inserted. Also claims 31 and 32 have been rewritten and in their place a new set of claims 42, 43 and 44 have been inserted. From an examination of these four sets of claims 33 - 35, 36 - 38, 39 - 41 and 42, 43, the Examiner will realize that each of the sets is identical and each of the sets is dependent upon a different independent claim.

This action is being taken in line with the suggestions courteously extended by the Examiner at the interview. This clearly makes the species claims to the resonating columns specifically indicated in Figs. 3 and 7 (Fig. 6) dependent upon claims which are generic to any mounting of a resonating column. In view of the action taken and the interview, it is not thought that there should be any further problem relating with respect to this point and with respect to the election of species made.

In view of comments made at the interview, claim 15, 20, 27 and 28 have all been amended so as to use the term "means operatively associated with" in describing the nature of individual means employed. It is believed that these amendments of essentially formal nature will clear up any difficulty of the type indicated in the initial rejection of claims 1 - 4 in the Patent Office action mailed July 17, 1957.

In addition all of the claims in this case have been carefully reviewed and claims 23, 24, 25 and 26 have been cancelled as being unnecessary for the protection of the invention. Also claims 20, 27 and 28 have been amended so as to change the manner in which the mountings of the tone bars or sound generating elements are specified. All of these claims now use the term "attached to". This term is considered to be broad enough so as to cover any specific type of mounting structure in which the tone bars are held or engaged by the keys so as to be rotated at the same time these keys are rotated.

Also claims 20, 27 and 28 have been amended along the lines indicated by the Examiner at the interview so as to specify the normal and playing positions of the keys with respect to the parts which engage the tone bars so as to actuate them.

It is believed that the action taken by this amendment is in accordance with the interview insofar as possible. An early and favorable action by the Patent Office is respectfully solicited.

Respectfully submitted,

Edward D. O'Brian

May 16, 1958

POL-90
Rev.

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WASHINGTON 25, D. C.

U. S. DEPARTMENT OF COMMERCE
PATENT OFFICE
WASHINGTON

All communications regarding this application should give the serial number, date of filing, and name of the applicant.

PAPER No. 10

Edward D. O'Brian
541 S. Spring St.
Los Angeles 13, Calif.

Applicant:	Clair Omar Musser
Ser. No.	561,420
Filed	Jan. 26, 1956
For	TOY MUSICAL INSTRUMENTS

MAILED
JUN 10 1958
5

Please find below a communication from the EXAMINER in charge of this application.

Robert C. Watson
Commissioner of Patents.

Responsive to amendments filed Jan. 15, 1958 and May 19, 1958.

Additional references applied:

Marks	2,052,890	Sept. 1, 1936	84-404 xr
Alvarez	2,486,545	Nov. 1, 1949	84-1.15

References cited of interest:

Duncan	2,759,387	Aug. 21, 1956	84-404
Alvarez	2,799,196	July 16, 1957	84-1.04

Correction of the drawings with regard to the reference numeral 34, as set forth in the last Office action, is required.

It is noted that there are allowed claims to the species of tone bar actuator shown in Fig. 3 in combination with the resonance column arrangement shown in Fig. 7. It is further noted that applicant has submitted a sketch combining Fig. 3 and Fig. 7. A formal drawing embodying this sketch but excluding any new matter is required. Applicant's attention is directed to 35 U. S. C. 132 which specifically sets forth that new matter may not be introduced into the application.

The proposed amendment to claim 20, line 3 has been inserted after the first occurrence of "housing" only.

Claims 10 to 12 and 33 to 35 are allowed.

Claims 27 to 30, and 42 to 44 are rejected as being vague and indefinite. In claim 27, lines 8 to 10, the statement "a support member----edge thereof;" should apparently be canceled. In line 5 a word such as parallel should apparently be inserted after "generally". In line 3 of claims 27 and 28 the statement "ledge" should apparently read key support ledge since otherwise there is no proper antecedent basis for the inclusion of a "key support ledge" in lines 20 and 19 of claims 27 and 28 respectively.

Claim 20 is rejected as being unpatentable over the disclosure of the German patent in view of the disclosure of the patent to Alvarez No. 2,486,545. These claims are clearly readable upon the device shown in the German patent excepting only for the statement of the specific location of the tone bar. The patent to Alvarez shows that it is old to mount a tone generating element upon the rearward end of a key. It is held, therefore, that it would not involve invention to mount the tone bar shown in the German patent directly upon the key member in view of the disclosure of the patent to Alvarez. In any event, the German patent shows substantially the structure set forth in this claim since the tone bar is mounted upon a member which is indirectly connected by means of linkage to the key.

Claims 39 to 41 are rejected as being unpatentable over the disclosure of the German patent in view of the disclosure of the patent to Alvarez number 2,486,545 and the disclosure of the patent to Deagan. These claims differ from claim 20, rejected above, only in setting forth the use of a resonance

column. The patent to Deagan shows that it is manifestly old to use a resonance column positioned adjacent a tone bar. It is held, therefore, that it would not involve invention to provide the device disclosed in the German patent with a resonance column for the tone bars. With regard to the statement in these claims of the specific location of the tone bar it is held that such positioning is a matter of routine engineering design only and as such does not constitute invention. The mere repositioning of parts in order to secure compactness and neatness or to merely produce a better result is not invention. See In re Staude 405 O.G. 549; 1931 C.D. 135.

Claims 27 through 30 are rejected as being unpatentable over the disclosure of the German patent in view of the disclosure of the patent to Alvarez No. 2,486,545 and the disclosure of the patent to Marks. These claims differ from claim 20, rejected above, only in setting forth the specific arrangement of a housing in combination with the key members. The patent to Marks discloses a housing (see Fig. 2) having a longitudinal slot therein. The reference further shows that there is a key support member 25, a key support ledge 24 and a recess in the key cooperating with a projection on the housing to provide for pivoting movement of the key. It is held that to merely rearrange the parts in the device disclosed by the German patent to provide a simplified key mounting as shown in the patent to Marks would not constitute invention. With regard to the specific mounting of the tone bar it is held that such arrangement does not patentably define over the arrangement shown in the German patent and in

any event the mounting of a tone generating element upon the key, as discussed above, is a matter of engineering design and is anticipated by the patent to Alvarez.

Claims 42 to 44 are rejected as being unpatentable over the disclosure of the German patent in view of the disclosure of the patent to Alvarez, the disclosure of the patent to Marks, and the disclosure of the patent to Deagan. These claims differ from claims 27 to 30, rejected above, only in setting forth the use of a resonance member in cooperation with the tone bar. This addition of a resonance tube is merely additive in this device and in any event is clearly anticipated by the disclosure of the patent to Deagan. Applicant has done no more than to select a plurality of individual features from the prior art and incorporate them into a unitary structure without materially altering the structure or function of each individual feature and without producing any new or unexpected result. See In re Attwood 117 U.S.P.Q. 184.

Claims 15, 16, 36 to 38 stand withdrawn from further consideration by the Examiner, Rule 142 (b) as not readable on the elected species.

The patent to Duncan is cited of interest for its showing of the usual mounting of a piano key in a housing of a toy piano. The patent to Alvarez No. 2,799,196 is cited of interest for its showing of the mounting of a tone generating member upon the end of a key.

Summary:

Claims 1 through 9, 13, 14, 17 to 19, 21 to 26 and 31 and 32 have been canceled.

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Claims 10 to 12, and 33 to 35 are allowed.

Claims 15, 16, and 36 to 38 are held withdrawn.

Claims 20, 27 to 30, 39 to 44 are rejected.

C W Robinson

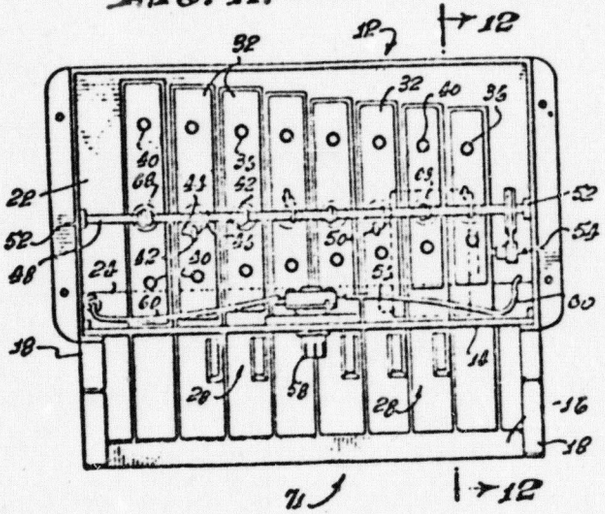
Examiner

GAGustafson:dc

DIV 5

561420

FIG. 11.



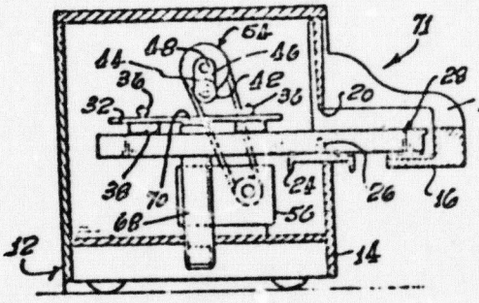


FIG. 12.

CLAIR OMAR MUSSER,
INVENTOR.

BY

ATTORNEY.

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This is an additional sheet of drawing and must be submitted to the Chief Draftsman before entering in the case

MAIL DIVISION
JUL -7 1958
U.S. PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE

RECEIVED
JUL 18 1958
DIVISION 5

CLAIR OMAR MUSSER :

SERIAL NO.: 561,420 : DIVISION 5 PAPER NO. 12

FILED: JANUARY 26, 1956 :

FOR: TOY MUSICAL INSTRUMENTS:

AMENDMENT

Hon. Commissioner of Patents

Washington 25, D.C.

Sir:

In response to the Patent Office action mailed June 10, 1958, please amend the above noted application as follows:

Cancel claim 20;

Claim 27, line 3, before "ledge" insert, -key support-; line 5, after "generally" insert, -parallel-; lines 8 to 10, cancel the clause "a support member.... thereof;";

Claim 28, line 3, before "ledge" insert -key support-;

Please enter the accompanying sheet of drawings illustrating both of the elected species of the invention.

REMARKS

In response to the above noted Patent Office action the changes in claim 27 and 28 courteously suggested by the Examiner have been made. It is regretted that these errors were made in typing claims 27 and 28 in final form. In addition a new sheet of drawings prepared as indicated in the sketch previously submitted to the Patent Office is enclosed herewith. With respect to the matter of the numeral "34" inquiry is respectfully made if the Patent Office would be willing to insert this numeral in the drawing free of charge to the Applicant. When the undersigned was an Examiner in the Patent Office, the Drafting Division of the Patent Office often did this in order to avoid an undue amount of red tape and correspondence.

The rejection of claims 27, 28, 29 and 30 as being unpatentable over the German patent in view of the disclosure of the Alvarez patent #2,486,545 and in view of the patent to Marks is respectfully traversed. It is believed that the Examiner in rejecting these claims on this combination of references failed to take a number of matters into consideration, and failed to completely consider the nature of this invention.

The German patent cited has been discussed in preceding amendments, and claim 10 and other claims in this application were allowed over this specific reference. Claims 27, 28, 29 and 30 presented in this application are all patterned after the allowed claim 10

but differ from it in a number of respects. Claim 27 is the broadest of these claims and is considered to be of a generic category. It specifically defines a numberof details with respect to the manner in which the keys used with this invention are formed and mounted with respect to a complete housing. In addition it spells out in broad terminology the use of an individual member within the housing for striking each of the tone bars and means for moving these individual members so that the tone bars are periodically engaged by them after they have been rotated to a playing or operative position.

Claim 28 differs from claim 27 in that it is more specific than claim 27 as to the precise mechanism used for hitting the tone bars. It specifically spells out the use of a shaft which is rotatably mounted within the housing and a plurality of arms attached to the shaft, each of these arms carrying means which are adapted to strike the tone bars. Claims 29 and 30 are dependent upon claim 28. Claim 29 specifies the fact that the arms project radially about the shaft in different directions, and claim 30 goes into some detail as to the type of ring structure used at the ends of the shaft.

It is respectfully submitted that the combination of references applied by the Examiner does not teach what is defined in these claims. The Examinerhas indicated that he does not consider there is invention in the specific type of key structure set forth because of the

fact that the Marks patent indicates a ledge 24 which limits the rotation of the keys in the Marks structure. The Marks structure is not at all analogous to what is defined in these claims. In the Marks structure when the keys are actuated, the wire loops 33 hit against the hammer members shown so as to literally bounce these hammer members up against the tone bars. Thus, with the Marks structure any need for a positive limitation as to the amount of rotation permissible with the keys is, in effect, missing.

With the present invention there is a definite necessity for limiting the rotation of the keys a specific amount because the tone members are directly attached or connected to these keys. It is necessary to limit the rotation of the keys of the present invention in order to prevent the tone members or tone bars from being lifted more than is desired. This is because of the character of the means for actuating those tone bars used with this invention. The tone bars are not actuated in the present invention by a static type of structure, and they are not actuated by a hammer which is literally bounced as in the Marks structure. The tone members with this invention are actuated by moving means, the operation of which would be interfered with, and probably ruined if the tone bars were moved too far.

Thus, with the present invention precise control of the amount of rotation of the tone bars is a necessary

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factor in achieving satisfactory operation. If the tone bars are moved too far, the operation of the means for actuating these tone bars is interfered with. This feature of the invention is clearly not shown by any of the references of record and is specifically defined in claims 27, 28, 29 and 30.

The Alvarez patent shown by the Examiner can hardly be considered pertinent to the structure of this invention. With the operation of the Alvarez structure it is substantially immaterial how far the keys are rotated in use. These keys are of such a nature that when they are rotated against the stops 19 the keys themselves hit against these stops setting forth apparently a very small amount of vibration in metal reeds 15 which extend from the keys themselves. Such a small amount of vibration from the reeds is picked up by coils 21 and 28 and fed back through a magnetic amplifier. The reeds 15 in the Alvarez structure are not actuated by any members which directly hit them; all that is necessary is that some minor amount of vibration be transmitted to them.

With the structure of the present invention the tone bars are deliberately and directly engaged and correct positioning of these tone bars with respect to the members hitting them is a necessity for the correct functioning of the instrument. This is not even suggested by the Alvarez reference. With the structure of the present invention a very simple type of key arrangement is used and the tone bars are attached or connected to

these keys. There is no chance of failure of a complicated mechanical linkage with this type of structure. Further, it is virtually child-proof, and yet the instruments of the invention function properly. There is no danger of children moving the keys to such an extent to interfere with the means for actuating them. This is important and is not considered to be shown by any of the references of record.

Claims 42, 43 and 44 have been rejected on the basis of the German patent, the Alvarez patent, the Marks patent and the Deagan reference. These claims are identical to the allowed claims 33, 34 and 35. Because of this it is believed that the Examiner will have no question with respect to the allowability of these claims if he finds the independent claims 27 and 28 allowable. There is no point in denying that claim 42 is inserted in this application only because the Patent Office rules with respect to the election of species. It specifically defines the use of a resonating column in the combined structure of the independent claims broadly.

Claims 43 and 44 are, however, considered to be very important. With the type of structure defined in the independent claim 20 the tone bars are rotated when the keys themselves are actuated. Claim 43 defines a structure in which the resonating columns are mounted so as to rotate with the tone bars in order to obtain a sustained resonating effect. This type of structure

can hardly be considered to be anticipated by the first three references cited since none of them show resonating columns, and indeed in certain of them, such as the Alvarez patent, there is no need for a resonating column. The Deagan reference does not show rotating tone bars and, hence, cannot be held to anticipate the rotating tone bar and resonating column structure set forth in claim 43.

The dependent claim 44 describes what is considered to be an extremely unique effect. With the type of structure defined, the degree of resonance achieved varies depending upon the position to which the keys are rotated. In other words, the tone bars with this type of structure will continue to vibrate even after the keys are released, but because these keys are moved with respect to the resonating columns, the amount of sound reinforcement will vary so as to be substantially zero when the keys reach their initial position. This is a unique effect which is not shown by any of the references including the Deagan reference where the resonating columns are fixed with respect to the tone bars.

It is believed that the Examiner in acting upon the claims of this application has adopted what is an unrealistic standard of invention in this field. It is also believed that he has failed completely to comprehend the commercial status of what is defined in the claims of this application. If necessary affidavits of commercial success can be submitted showing well over

a million dollars worth of sales of toy musical instruments as defined herein during the first year in which these instruments were on the market. This is definite commercial success. It has invited copying as can be seen from the Petition to Make Special filed with this application. Because of this, it is believed that the Examiner should realistically consider the claims presented in this application and should allow reasonable claims in order to afford the inventor some protection. In the absence of reasonably broad claims in this case patent protection will not prove beneficial to the Applicant.

In determining what standard of invention to apply to this case it is requested that the Examiner refer to the decision of the Court of Customs and Patent Appeals In re Hummer, CCPA, 1957, 113 USPQ 66. This decision pertains to a patent application containing claims in the very crowded building art. It can hardly be questioned that the fact situation here is at least analogous to the facts situation in this application. The number of references of record here clearly show that the art of toy musical instruments is not exactly a pioneer art or field. In holding that the Examiner should allow patent protection on even comparatively minor improvements in a crowded art, the Court of Customs and Patent Appeals stated as follows (p.68):

> "The building art is one of the oldest known to man and it can aptly be described as 'crowded'. It will be observed from the limitations of the claims that the applicant seeks a patent on only a narrow improvement. Progress is as important, however, in corwded arts as well as in those which are in the pioneer stage, In re Tamarin, 38 CCPA (Patents) 872, 187 F.2d 160, 88 USPQ 490, and such progress is usually made in small increments."

Further, the Court in this decision indicated that the concept of doing a thing must be considered as well as the actual steps in doing it, citing the decision In re McKenna, CCPA, 1953, 97 USPQ 348 where it was stated (p. 351):

> "The mere fact that elements of applicants' process may be found in various patents does not necessarily negative invention.***Moreover, the concept of doing a thing, the result of which is new and useful and unexpected must be considered along with the actual steps of doing it in considering the presence or absence of invention and patentability."

Then the Court went on to state in the Hummer decision, supra, (p. 69):

> "The same principles are applicable to mechanical combination."

Clearly the references of record, such as the Alvarez reference pertaining to a device requiring an electrical amplifier and the Marks patent pertaining to a key which bounces a hammer and the German reference showing a rather complicated series of mechanical linkages which are difficult to follow do not show the simple type of mechanical structure set forth in the claims. This simple structure is effective. It is virtually childproof. It is of very definite commerical importance as indicated by the sales figures indicated above. Therefore, since the concept of what is defined in the claims is not shown in the references it is submitted that these claims must be allowed as a matter of law.

In further considering this matter, it is requested that the Examiner follow the well known rule that any doubt on the question of patentabilitymust be resolved in favor of the Applicant as indicated in the In re Hummer, supra, and In re Pappus et al, CCPA 1950, 88 USPQ 108.

An early and favorable action by the Patent Office is respectfully requested.

This amendment is being submitted to the Patent Office as soon as time permits after the preceding Patent Office action was received and allowing time for ordering and obtaining copies of references cited in the U. S. Patent Office action as well as time for several conferences with the inventor named in this application. Because of this it is requested that the special status with respect to this application be continued. It is anticipated that an interview will be requested in this application in the immediate future.

Respectfully submitted,

Edward D. O'Brian

July 2, 1958

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON 25, D. C.

U. S. DEPARTMENT OF COMMERCE
PATENT OFFICE
WASHINGTON

All communications respecting this application should give the serial number, date of filing, and name of the applicant.

PAPER NO. 13

Edward D. O'Brian
541 S. Spring St.
Los Angeles 13, Calif.

Applicant: Clair Omar Musser	
Ser. No. 561,420	MAILED
Filed Jan. 26, 1956	AUG 7 1958
For TOY MUSICAL INSTRUMENTS	PAT DIV 5

Please find below a communication from the EXAMINER in charge of this application.

Robert C. Watson
Commissioner of Patents.

Responsive to the amendment filed July 7, 1958.

The requirement to correct the drawings with regard to the reference numeral 34 as set forth in the last Office action is repeated.

The additional sheet of drawing submitted July 7, 1958 has been received; however, such drawing has not been entered in the case since it would appear that as shown the device would not be operative. In this regard, applicant's attention is directed to Fig. 12 on the new sheet of drawing. It is not seen how the resonating column 68 can be effectively moved by the key since it would appear that such element interfers with the horizontal platform or partition which supports the motor 56. In addition, it would appear that the last three resonating columns shown in Fig. 11 would interfer with the motor housing itself. Clarification of the abovementioned matters is required if this sheet of drawing is to be entered; however, applicant is cautioned against the introduction of new matter into the application.

Claims 10-12, 28-30, 33-35, and 42-44 are allowed.

Claims 15, 16, and 36-38 stand withdrawn from further consideration by the Examiner, Rule 142(b) as not readable on the elected species.

Claims 39-41 are rejected as being unpatentable over the disclosure of the German patent in view of the disclosure of the patent to Alvarez 2,486,545 and the disclosure of the patent to Deagan. The German patent clearly discloses a musical instrument including a housing, a plurality of pivoted keys extending from the housing, sound generating elements including the tone bars f, and a rotating member for periodically engaging the tone bars when the keys are depressed. These claims are clearly directly readable upon the disclosure of the German patent excepting only for reference to resonating columns mounted adjacent the tone bars. The patent to Deagan shows a plurality of tone bars and a plurality of respectively associated resonating columns 2 mounted adjacent the tone bars. It is held that it would not involve invention to provide the device disclosed in the German patent with resonating columns in view of the clear teaching in the patent to Deagan. With regard to the statements in these claims that the sound generating element is "resiliently attached to each of said keys" it is held that such an arrangement does not patentably define over the linkage

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arrangement between the tone bars and the keys as shown in Fig. 1 of the German patent and in any event, the patent to Alvarez clearly shows that it is old to mount a tone generating element upon the rearward en of a key member. With regard to the inclusion in these claims of reference to the specific location of the resonating columns, it is held that such positioning is a matter of routine engineering only and does not constitute invention since it is manifest that no new or patentable result accrues from the specific location of the resonating column with respect to the tone bar.

Claim 27 is rejected as being unpatentable over the disclosure of the German patent in view of the disclosure of the patent to Alvarez and the disclosure of the patent to Marks. This claim is clearly readable upon the device disclosed in the German patent excepting only for the inclusion of reference to a specific mounting arrangement for the key members with respect to the housing of the device. In this regard, applicant's attention is directed to the shaded support members extending transversely of the housing as shown in the German patent which are positioned beneath the key board and operate to support the same. The German patent further shows that the key board extends through an opening in the housing. In any event, the patent to Marks clearly shows a mounting for the keys of a toy piano including a forwardly positioned ledge 24, a rearwardly positioned ledge 25, an opening or slot in.

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the front of the housing 32 and a recess in the key cooperating with projections on the housing.

It is held, therefor, that it would not involve invention to mount the keys shown in the German patent in the manner disclosed by the patent to Marks. With regard to the specific mounting of the tone bar as set forth in this claim, it is held that such statement does not patentably define over the mounting of the tone bars shown in the German patent since this claim merely sets forth that the tone bars are "resiliently attached to" the key members. In any event, as pointed out above, the patent to Alvarez 2,486,545 clearly indicates that it is a common expedient to mount tone generating elements upon the rearward end of a key member.

No additional references having been applied an an issue having been reached the above rejection is made FINAL.

Summary:

Claims 10-12, 28-30, 33-35, and 42-44 are allowed.

Claims 199, 13, 14, 17-26, 31, and 32 have been canceled.

Claims 15, 16, and 36-38 are held withdrawn.

Claims 27 and 39-41 are FINALLY rejected.

C. W. Robinson

Examiner

G.A.Gustafson:nch

MAIL ROOM
OCT 20 1958
U.S. PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE

CLAIR OMAR MUSSER :
SERIAL NO.: 561,420 : DIVISION 5
FILED: JANUARY 26, 1956 :
FOR: TOY MUSICAL INSTRUMENTS:

RECEIVED
OCT 22 1958

DIVISION 5 PAPER NO. 14

AMENDMENT

Letter

Hon. Commissioner of Patents
Washington 25, D.C.

Sir:

The Assistant Examiner, Mr. Guastafson, handling this application, and the Primary Examinerof Division 5 of the Patent Office, are respectfully thanked for the courtesies extended to the undersigned several weeks ago when he was in Washington. At this time the Patent Office action in this application, dated August 7, 1958, was discussed in detail, and a sample of a commercial toy of this invention and of the Spear organ were examined. Reference was made to the precise key structure used in the Spear organ and the wording in certain of the claims of this application as to the key structure made necessary by the Spear infringement.

According to the oral agreement reached during the interview, two patent drawings were prepared while the

undersigned was in Washington showing different embodiments of the present invention. Upon the return of the undersigned to the Los Angeles area two continuation-in-part applications were prepared for filing in the U. S. Patent Office. These continuation-in-part applications are both identified by the title "TOY MUSICAL INSTRUMENTS." The application bearing the file number of the undersigned #584 pertains to the elected species of the invention utilizing a shaft from which there extend arms carrying small rings used to actuate tone bars. The application designated by the File #585 pertains to the use of a vibrator so as to actuate the tone bars in the instrument. Both new applications are being filed so as to clear up certain problems of record as to the nature of the disclosure in this case. This File #585 application corresponds to the non-elected species of actuator in this case.

In accordance with the agreement, the claims in the application designated bythe File #584 are the same as the allowed claims present in this application to the elected species as follows:

Claim 28 is claim 1 in the new application; claim 29 is claim 2; claim 30 is claim 3; claim 42 is claim 4; claim 43 is claim 5; claim 44 is claim 6; claim 10 is claim 7; claim 11 is claim 8; claim 12 is claim 9; claim 33 is claim 10; claim 34 is claim 11; and claim 35 is claim 12.

In the other application designated by the File #585 only one claim is submitted. This claim is patterned after claim 27 in this case but differs from claim 27 in that the last seven lines of claim 27 have been cancelled and have been replaced by a detailed recitation of the vibrator-type of actuatiing structure.

These new applications are being filed concurrently herewith. It is regretted that it has been impossible to get these new applications on file sooner, due to the fact that the inventor, Mr. Musser, was on an extended trip from the Los Angeles area. As soon as he returned, the work in preparing these applications was completed, and they are being mailed to the Washington correspondent of the undersigned.

This correspondent is being instructed to personally take these new applications to the Application Division and then to contact the Assistant Commissioner of the Patent Office to attempt to speed up the processing of the new applications. This procedure was worked out at the time of the interviewwith Mr. Gustafson as indicated above. If this procedure is successful, these new applications should reach the Examining Division in about ten days to two weeks.

In accordance with the conclusions reached at the interview these new applications will be allowable as filed, since they contain only the same claims or, in one case, substantially the same claim as is in this application.

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Mr. Gustafson has seen the drawings of these new applications; he clearly indicated that they overcame the various technical objections of record in this case.

It is believed that the Patent Office will realize that the action being taken here is being taken as promptly as reasonably possible under all the circumstances involved. At the interview indicated above, it was stated that the new applications being filed in place of this case would be handled on a "special" status since they would be allowable. Accordingly, an early and favorable action by the Patent Office is requested on the new applications. This application itself will be abandoned while the subject matter of this application is carried forward in the new cases.

Respectfully submitted,

Edward D. O'Brian

October 13, 1958

OCT 27 1959

IN THE UNITED STATES PATENT OFFICE

CLAIR OMAR MUSSER :
SERIAL NO.: 561,420 :
FILED: JANUARY 26, 1956 :
FOR: TOY MUSICAL INSTRUMENTS:

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DIVISION 5
DIVISION 5 PAPER N

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SUPPLEMENTAL AMENDMENT

Hon. Commissioner of Patents
Washington 25, D.C.

Sir:

Please amend the above noted application as follows:

Cancel claims 28, 29, 30, 42, 43, 44, 10, 11, 12, 33, 34, and 35 without prejudice.

REMARKS

The above claims are being cancelled from this application since they are presented in another application which has recently been filed in the U. S. Patent Office in the order listed above. This action is being taken since the Assistant Examiner, Mr. Gustafson, and the Assistant Chief, Mr. McNab, indicated that the new application containing these claims might be rejected on the ground of double patenting, unless the claims indicated

were cancelled in this case. This indication came at an interview between the Washington correspondent of the undersigned, Mr. William Mathis, and the officials of the Patent Office indicated.

The remaining claims in this application will be cancelled or other appropriate action will be taken as soon as the filing receipts of the new applications based upon this application have been received.

Respectfully submitted,

Edward D. O'Brian

Edward D. O'Brian

October 23, 1953

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FINISH

881420
SERIAL NO. (Series of 1948)

P. R. Div.

Assistant examiner

Division No.
5

Applicant(s)

Spec. read & wdf

ASSER

SEARCHED

Class	Sub	Date	Ex'r
84	257 404-5	3-24-56	RCF
84	410 404 405 102	7/8/57	RCF
84	1.04, 1.19, 1.15, 402, 403, 404, 405	7/30/58	RCF
84	402-405	Aug 58	RCF

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	60	✓		120	

SYMBOLS	STATUS
/	Rejected
-	Allowed
- (Through numeral)	Canceled
=	Restriction requirement
N	Nonelected invention or species
I	Interference
A	Appeal

B

C

U. S. DEPARTMENT OF COMMERCE
PATENT OFFICE
WASHINGTON

ADDRESS ONLY THE COMMISSIONER OF PATENTS WASHINGTON 25, D. C.

All communications regarding this application should give the serial number, date of filing and name of the applicant.

PAPER No. 16

Edward D. O'Brian
541 S. Spring St.
Los Angeles 13, Calif.

Applicant: Clair Omar Musser	
Ser. No. 561,420	MAILED
Filed Jan. 26, 1956	NOV 6 1958
For TOY MUSICAL INSTRUMENTS	

Please find below a communication from the EXAMINER in charge of this application.

Robert C. Watson
Commissioner of Patents.

Responsive to letter filed October 20, 1958 and amendment filed October 27, 1958. The above mentioned amendment has been entered and claims 10, 11, 12, 28, 29, 30, 33, 34, 35, 42, 43 and 44 have thereby been canceled; however, inasmuch as the amendment does not place the case in condition for allowance the case stands as of the final rejection of August 7, 1958.

Suitable response must be received on or before February 7, 1959.

Response due on or Before February 7, 1959.

A. W. Robinson

GAGustafson:cd

Examiner

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References applied:

Deegan	1,993,772	Feb. 11, 1919	84-4-10

Additional References Applied:

Marks	2,052,890	Sept. 1, 1936	84/404 X R
Alvarez	2,486,545	Nov. 1, 1949	84/1.15

References cited of interest:

Duncan	2,757,387	Aug. 21, 1956	84-404
Alvarez	2,799,196	July 16, 1957	84-1.04

ATTORNEY'S ROOM
NOV 4 1966
U.S. PATENT OFFICE

#17

November 3, 1966

Hon. Commissioner of Patents

Washington, D. C.

PETITION FOR ACCESS TO
ABANDONED APPLICATION

S i r :

The undersigned hereby petitions for access to abandoned application Serial No. 561,420, filed January 26, 1956, entitled Toy Musical Instruments.

This abandoned application is mentioned in both patent 2,871,746 (column 4, line 53) and patent 2,873,639, (column 4, line 54).

Access is necessary to determine the validity of the claims of the issued patents.

Respectfully,

SHOEMAKER AND MATTARE

~~Box 268~~

APPROVED
NOV 4 1966
ATTORNEY'S ROOM

DJR:pk

95

CANTWELL & LENKER
2043 CRYSTAL PLAZA DRIVE
ARLINGTON, VA. 22202

PATENT AND TRADEMARK SECTION
TELEPHONE:
AREA CODE 703
521-4747

KAT ATTORNEY'S ROOM

JUN 27 1973

U. S. PATENT OFFICE

June 27, 1973

Commissioner of Patents
Washington, D. C. 20231

Sir:

Petition for access is requested to the abandoned patent application Serial No. 561,420 filed January 26, 1956 and mentioned in Musser 2,873,639.

Very truly yours,

Cantwell & Lenker

By W. I. Lenker

APPROVED

JUL 3 1973

ATTORNEY'S ROOM

96

Form PTO-436 (12-1-55)

COMM-DC-55367

767081 SERIAL NO. (Series of 1948)	P. R. Div.	PATENT NUMBER 2873639
Assistant examiner	Class 84	Subclass 4 C.
Division No. 5	Filed complete (Date) OCT 20, 1958	Serial No. 767 081

DATED FEB 17 1959

CLAIMS FOREIGN PRIORITY

Country	Date

Applicant(s)

MUSSER, CLAIR OMAR OF STUDIO CITY, CALIF.

Number claims allowed	Print claim(s)	Class	Subclass
12	1	84	4

Assignor to

Title of invention

Piano Having Key Mounted Tone Bars

TCY ~~MUSICAL INSTRUMENTS~~

☐ Division of ☐ Continuation of ☐ Substitute for abandoned ☑ Continuation-in-part of

APPLICATION

Serial No.	Filed

Now Patent No.	Granted

APPLICATION

Serial No. 56142C

Filed Jan. 26, 19

Sh. drw.	Extra claims	Filing fee	Transaction	Atty's docket
1		$30	40679	584

Send correspondence to:

EDWARD D. O'BRIAN
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Washington 5, D.C.

Principal attorney(s)

EDWARD D. O'BRIAN

Associate attorney(s)

William Mathis

PARTS OF APPLICATION FILED SEPARATELY

PREPARED FOR ISSUE

(Assistant Examiner) (Docket Clerk)

EXAMINED AND PASSED FOR ISSUE

(Primary Examiner)

NOTICE OF ALLOWANCE MAILED 143

767081

11-27-58

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3. Nov. 3, 1958
4. Title Report Nov. 24, 1958
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767081 - P
SERIAL NO. (Series of 1964)

Assistant examiner

Division No.

5
Applicant(s)

SEARCHED

Class	Sub	Date	Ex'r
84	1.04, 1.14, 1.15, 402-403	11-10-58	[illegible]

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SYMBOLS — STATUS

/ ..... Rejected

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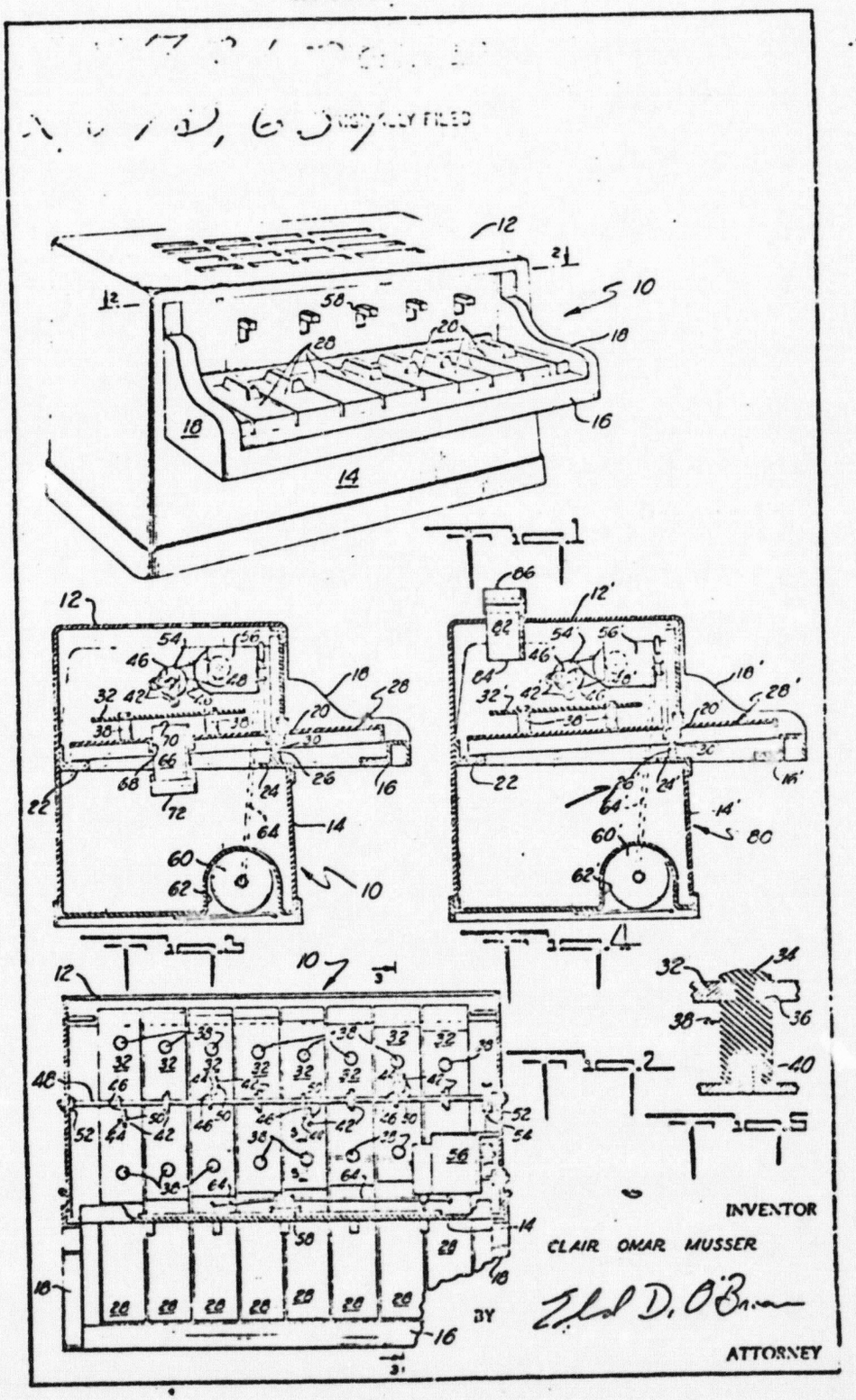
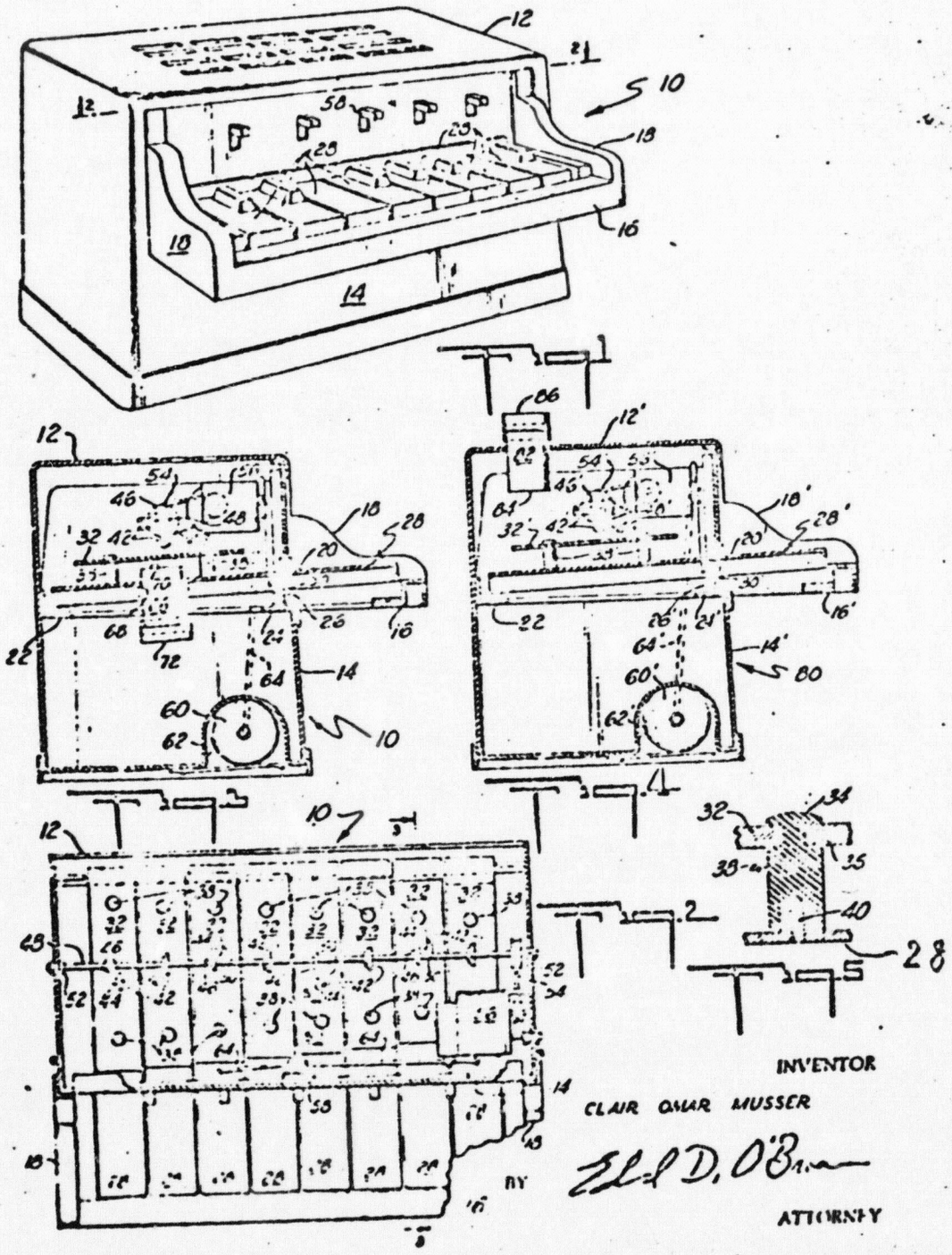


Feb. 17, 1959 C. O. MUSSER 2,873,639

TOY PIANO HAVING KEY MOUNTED TONE BARS

Filed Oct. 20, 1958



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United States Patent Office

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Patented Feb. 17, 1959

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TOY PIANO HAVING KEY MOUNTED TONE BARS

Clair Omar Musser, Studio City, Calif.

Application October 20, 1958, Serial No. 767,081

12 Claims. (Cl. 84—404)

This invention relates to new and improved toy musical instruments.

Virtually every parent, at one time or another, by necessity suffers through a variety of disconcerting nondescript sounds produced by a child through the use of one or more common toy musical instruments. A basic objective of this invention is to provide toy musical instruments which are capable, when properly constructed, of producing more melodious noises than can be produced by many of the known similar devices.

It is thought that the disconcerting sounds so often produced by common toy musical instruments are, at least in part, a result of the manner in which these instruments are constructed. Any toy musical instrument must be comparatively rugged in order to withstand the onslaught of the younger generation; further, it must be capable of being easily and conveniently produced on a mass production basis, at a cost which is not prohibitive. An object of this invention is to provide toy musical instruments which can be easily and conveniently produced by mass production techniques, and which, in spite of such production, are capable of producing comparatively harmonious, acceptable noises. A related object of the invention is to provide toy musical instruments which are rugged in construction so that it is comparatively impossible for the normal child to damage them, except with deliberate malice.

A further object of this invention is to provide toy musical instruments capable of producing sound effects closely resembling the sound effects which may be achieved by much more expensive adult instruments such as organs or the like. This latter objective of the invention is quite important inasmuch as children inherently try to imitate parents, and like to play with toys which bear at least a superficial resemblance, in appearance and performance, to apparatus or equipment which their parents use. The new toy musical instrument of this invention can be made to resemble in outward appearance a piano, or by appropriate inclusion and construction of resonating means, an organ. Through the use of special means for actuating sound generating elements employed with the toy musical instruments of this invention, it is possible to very closely simulate the sound produced by an electric organ. Such sound effects have not, it is thought, been satisfactorily achieved in any low cost device of the class described prior to this invention.

Further objects of this invention, as well as many specific advantages of it, will be more fully apparent from the remainder of this description, including the appended claims and the accompanying drawing in which:

Fig. 1 is a perspective view of a toy musical instrument of this invention;

Fig. 2 is a cross sectional view taken at line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional view taken at line 3—3 of Fig. 2;

Fig. 4 is a view similar to Fig. 3 of a modified toy musical instrument of this invention; and

Fig. 5 is a partial cross-sectional view taken at line 5—5 of Fig. 2.

In all figures of the drawing, like numerals are used to designate like parts whenever convenient for purposes of illustration and explanation. It is to be understood that this invention is not to be considered as being limited to structures having the precise proportional sizes or shapes illustrated inasmuch as a number of modifications may be made in the structures shown without departing from the essential nature of the present invention.

The actual features of this invention are considered to be fully defined or summarized in detail by the appended claims forming a part of this description. If desired, however, as an aid to understanding the invention, it may be briefly stated in summary form that this invention relates to toy musical instruments, each of which includes a support member, a plurality of arms movably mounted on this support member, a sound generating element mounted on each of these arms so as to be moved when each of the arms is moved, and means for actuating each of these said sound generating elements so as to produce sound, these means being mounted on the support member adjacent to the arms so that when said arms are moved the sound generating elements are moved into a location where they are actuated by these means, causing sound to be produced.

In Fig. 1 of the drawing there is shown a toy musical instrument of the invention 10, which includes a housing 12 in the general shape of a rectilinear box having attached to the front side 14 thereof a ledge 16. This ledge is secured to the housing by means of end supports 18; it is located so as to be generally parallel to an elongated slot 20 formed in the front side 14 approximately midway between the top of the bottom of the housing 12. Within the housing 12 there is located an elongated support member 22 so that this support member is positioned generally parallel to the slot 20. An elongated bar 24 is mounted on the housing 12 so as to project through the slot 22, and so that a series of elongated projections 26 formed thereon project upwards generally toward the center of this slot.

Upon each of the projections 26 there is positioned a key or arm 28 so that an elongated recess 30 within the bottom of each of these keys fits over one of the projections 26. The recesses 30 are preferably of larger cross-sectional dimension than the projections 26 so that the keys 28 are capable of being rotated about these projections during the operation of the instrument 10. Thus in effect the projections 26 may be termed "fulcrums." The lengths of the recesses 30 and of the projections 26 are preferably the same so as to hold the keys 28 against movement along the length of the slot 20.

The keys themselves normally are located as shown in Fig. 3 of the drawings so that portions of them rest against the support member 22. As is best seen in the drawings, the extremities of the keys 28 furthest removed from the housing 12 are, in this position, spaced from the ledge 16 so that a child or other individual playing the instrument 10 can push upon any of the keys 28 rotating the key so actuated about a projection 26 in order to bring a tone bar 32 into engagement with the means for actuating this tone bar. The tone bars 32 are, with the preferred construction of the invention, formed so as to each include two openings 34 located therein so that these tone bars may be supported in notches 36 on resilient rubber supports 38. These supports 38 fit over cylindrical projections 40 formed on the keys 28 as shown in Fig. 5. Thus, the supports 38 resiliently hold

the tone bars 32 upon the keys 28 so these tone bars are free to vibrate.

The tone bars 32 can be conveniently formed out of a number of commonly available materials such as stainless steel, aluminum or the like; they are so proportioned in size and dimension to produce a series of notes when the keys 28 are actuated. It is necessary that the supports 38 be formed out of a resilient material such as rubber or the like, if the vibrations produced by the tone bars 32 are not to be transmitted through the keys 28 when the instrument 10 is played. These keys may be conveniently formed out of wood or any common material such as polystyrene or the like, with a minimum of difficulty. In the preferred mode of manufacturing of the instrument 10, the tone bars 32 are assembled upon the keys 28 prior to the insertion of these keys within the housing 12.

The means for actuating the tone bars 32 so as to produce sound in the instrument 10 preferably comprise a plurality of percussion rings 42 formed out of metal or the like. These rings 42 are rotatably mounted upon projections 44 on arms 46 secured to a shaft 48; the rings 42 are prevented from coming off of the projections 44 by means of enlarged ends 50 on these projections. The shaft 48 is carried by bearings 52 secured to the housing 12; this shaft is adapted to be driven through a belt and pulley arrangement 54 by means of an electric motor 56 disposed within the housing 12. A switch 58 is attached to the front side 14 of the housing 12 in order to turn this motor on and off. If desired, the motor can be of the category which may be operated by household current supplied to the instrument 10 through an electric cord (not shown) or, if desired, this motor 56 may be actuated by conventional electric batteries 60 disposed in a battery cavity 62 within the housing 12. Internal wires 64 are employed to connect the batteries 60, the motor 56 and the switch 58 in a conventional manner.

It will be noted from an examination of Figs. 2 and 3 of the drawings that the arms 46 preferably project radially from the shaft in different directions. This is so that as the instrument 10 is played that the various rings 42 do not strike one or more of the tone bars 32 simultaneously so as to obtain a more pleasing musical effect than if all of the tone bars were actuated at one time.

The actual operation of the instrument 16 is relatively simple. A child merely presses upon one or more of the keys 28 bringing the tone bar 32 attached to each key so actuated into an upper position in which this tone bar is so spaced with respect to the shaft 48 that it is capable of being engaged by a ring 42. As the shaft turns, any such ring periodically engages the corresponding tone bar causing sound to be produced by this tone bar. In effect, a tremolo effect is thus produced. This tremolo effect achieved with the present invention closely resembles the tone which is obtained by an electric organ, and it is considered to be pleasing.

The use of the percussion rings 42 in the instrument 10 is noted. During the operation of the instrument these rings 42 are rotated about the projections 44 through engagement with the corresponding tone bars 32; also these rings can move slightly upon the projections 44 so that as they strike a tone bar a sharp blow is not applied to the tone bar, but instead the tone bar is actuated in a more gentle manner so as to produce vibrations. Thus, with this construction no sounds resembling the hitting of an anvil with a hammer result; the only musical tone noticed is one corresponding to the desired tone produced by a tone bar.

When it is desired to reinforce the tones produced by a tone bar 32 after the key 28 has been released, it is possible to dispose resonating columns 66 upon the keys 28 in the manner indicated in Fig. 3 of the drawing. The columns 66 are held within openings 68 in the keys 28 by an adhesive or other equivalent means. Each of the columns 66 has an open end 70 spaced from the center of a tone bar 32, and has a closed end 72 remote from this tone bar. The columns 66 appear as common tubes or cylinders.

The sizes of the column 66 are, of course, varied. In general the larger the tone bar 32, the longer the column 66 disposed beneath it is. These columns 66 are of such a dimension so as to effectively reinforce the tones or notes generated by vibration of corresponding tone bars 32. Because of the fact that the tone bars 32 are mounted on the keys 28 so as to be permanently spaced with respect to the resonating columns 66, the operation of these resonating columns is unaffected by the movement of the keys 28.

If desired, it is possible to provide a toy musical instrument 80 as shown in Fig. 4 of the drawing in which tone reinforcement by a resonating column varies as the instrument is played. Since the instrument 80 is identical with the instrument 10 previously described except for the resonating column structure the various identical parts of the instrument 80 are shown in the drawing designated by the primes of the numerals previously employed.

In the instrument 80 resonating columns 82 are employed instead of the columns 66 previously indicated. These columns 82 are graduated as to size in the same manner as the columns 66, and are provided with open ends 84 adjacent to, and above the ends of corresponding tone bars 32', and are provided with closed ends 86. With this construction as a key 28' is rotated so as to move the tone bar 32' attached to its so that this tone bar is engaged by a ring 42' in order to produce sound the spacing between this tone bar 32' and the corresponding column 82 is changed. As long as a key 28' is held so that its tone bar 32' is engaged by a maximum amount of sound reinforcement by the corresponding column 82 occurs. When the key 28' is is released the spacing between the tone bar 32' held by it and this resonating column increases, and the amount of sound reinforcement by the column 82 decreases quite rapidly because of this.

Those skilled in the art to which this invention pertains will realize that a large number of modifications may be made in the structures shown without departing from the essential nature of this invention. For this reason, the invention is to be considered as limited only by the appended claims forming a part of this description. Those skilled in the art to which this invention pertains will also realize that the various structures indicated herein are each very efficient to the purpose intended, are easily and cheaply manufactured, and are comparatively rugged. They will also realize that these structures are capable of producing pleasing sounds when actuated by a child.

This application is a continuation-in-part of the copending application Serial No. 561,420, filed January 26, 1956, entitled Toy Musical Instruments. The subject matter of this copending application is incorporated herein by reference.

I claim:

1. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a key support ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside of said housing so as to be pushed

into engagement with said key support ledge so as to rotate said keys about said projections to a playing position; a tone bar resiliently attached to each of said keys so as to be moved to a playing position when said keys are moved to a playing position; a shaft rotatably mounted within said housing above said tone bars, said shaft being generally parallel to said slot; means operatively associated with said shaft and mounted in said housing for rotating said shaft, a plurality of arms attached to said shaft so as to project therefrom, each of said arms being located generally above one of said tone bars; means operatively associated with each of said arms for periodically striking one of said tone bars when said keys are actuated so as to rotate about said projections to a playing position.

2. A toy musical instrument as defined in claim 1 wherein said arms project radially from said shaft and wherein said arms are spaced about said shaft so as to project from said shaft in different directions.

3. A toy musical instrument as defined in claim 1 including a projection attached to each of said arms at an extremity remote therefrom, each of said projections having an enlarged end thereon; and wherein each of said means attached to said arms comprises a ring positioned on one of said projections, said rings being held on said projections by said enlarged ends and being capable of rotation about said projections.

4. A toy musical instrument as defined in claim 1 including a resonating column mounted adjacent to each of said tone bars, each of said resonating columns having an open end located immediately adjacent to one of said tone bars.

5. A toy musical instrument as defined in claim 4 wherein each of said resonating columns is mounted upon one of said keys.

6. A toy musical instrument as defined in claim 4 wherein said resonating columns are mounted on said housing.

7. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside of said housing so as to be pushed into engagement with said key support ledge so as to rotate said keys about said projections; means extending upwards from each of said keys within said housing; resilient means located above each of said keys with respect to said means projecting upwards from said keys; a tone bar positioned upon said resilient means above each of said keys, each of said tone bars being held closely against lateral movement by said means projecting upwards from each of said keys; a shaft rotatably mounted within said housing above said tone bars, said shaft being generally parallel to said slot; means mounted in said housing for rotating said shaft, a plurality of arms attached to said shaft so as to project therefrom, each of said arms being located generally above one of said tone bars; means attached to each of said arms for striking one of said tone bars when said keys are actuated so as to rotate about said projections.

8. A toy musical instrument as defined in claim 7 wherein said arms project radially from said shaft and wherein said arms are spaced about said shaft so as to project from said shaft in different directions.

9. A toy musical instrument as defined in claim 7 including a projection attached to each of said arms at an extremity remote therefrom, each of said projections having an enlarged end thereon; and wherein each of said means attached to said arms comprises a ring positioned on one of said projections, said rings being held on said projections by said enlarged ends and being capable of rotation about said projections.

10. A toy musical instrument as defined in claim 7 including a resonating column mounted adjacent to each of said tone bars, each of said resonating columns having an open end located immediately adjacent to one of said tone bars.

11. A toy musical instrument as defined in claim 10 wherein each of said resonating columns is mounted upon one of said keys.

12. A toy musical instrument as defined in claim 10 wherein said resonating columns are mounted on said housing.

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FILE #584

TOY MUSICAL INSTRUMENT

This invention relates to new and improved toy musical instruments.

Virtually every parent, at one time of another, by necessity suffers through a variety of disconcerting nondescript sounds produced by a child through the use of one or more common toy musical instruments. A basic objective of this invention is to provide toy musical instruments which are capable, when properly constructed, of producing more melodious noises than can be produced by many of the known similar devices.

It is thought that the disconcerting sounds so often produced by common toy musical instruments are, at least in part, a result of the manner in which these instruments are constructed. Any toy musical instrument must be comparatively rugged in order to withstand the onslaught of the younger generation; further, it must be capable of being easily and conveniently produced on a mass production basis, at a cost which is not prohibitive. An object of this invention is to provide toy musical instruments which can be easily and conveniently produced by mass production techniques, and which, in spite of such production, are capable of producing comparatively harmonious, acceptable noises. A related object of the

invention is to provide toy musical instruments which are rugged in construction so that it is comparatively impossible for the normal child to damage them, except with deliberate malice.

A further object of this invention is to provide toy musical instruments capable of producing sound effects closely resembling the sound effects which may be achieved by much more expensive adult instruments such as organs or the like. This latter objective of the invention is quite important inasmuch as children inherently try to imitate parents, and like to play with toys which bear at least a superficial resemblance, in appearance and performance, to apparatus or equipment which their parents use. The new toy musical instrument of this invention can be made to resemble in outward appearance a piano, or by appropriate inclusion and construction of resonating means, an organ. Through the use of special means for actuating sound generating elements employed with the toy musical instruments of this invention, it is possible to very closely simulate the sound produced by an electric organ. Such sound effects have not, it is thought, been satisfactorily achieved in any low cost device of the class described prior to this invention.

Further objects of this invention, as well as many specific advantages of it, will be more fully apparent from the remainder of this description,

including the appended claims and the accompanying drawing in which:

Fig. 1 is a perspective view of a toy musical instrument of this invention;

Fig. 2 is a cross sectional view taken at line 2-2 of Fig. 1;

Fig. 3 is a cross-sectional view taken at line 3-3 of Fig. 2;

Fig. 4 is a view similar to Fig. 3 of a modified toymusical instrument of this invention; and

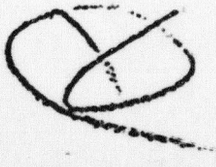
Fig. 5 is a partial cross-sectional view taken at line 5-5 of Fig. 2.

In all figures of the drawing, like numerals are used to designate like parts whenever convenient for purposes of illustration and explanation. It is to be understood that this invention is not to be considered as being limited to structures having the precise proportional sizes or shapes illustrated inasmuch as a number of modifications may be made in the structures shown without departing from the essential nature of the present invention.

The actual features of this invention are considered to be fully defined or summarized in detail by the appended claims forming a part of this description. If desired, however, as an aid to understanding the invention, it may be briefly stated in summary form that this invention relates to toy musical instruments, each of which

includes a support member, a plurality of arms movably mounted on this support member, a sound generating element mounted on each of these arms so as to be moved when each of the arms is moved, and means for actuating each of these said sound generating elements so as to produce sound, these means being mounted on the support member adjacent to the arms so that when said arms are moved the sound generating elements are moved into a location where they are actuated by these means, causing sound to be produced.

In Fig. 1 of the drawing there is shown a toy musical instrument of the invention 10, which includes a housing 12 in the general shape of a rectilinear box having attached to the front side 14 thereof a ledge 16. This ledge is secured to the housing 12 by means of end supports 18; it is located so as to be generally parallel to an elongated slot 20 formed in the front side 14 approximately midway between the top of the bottom of the housing 12. Within the housing 12 there is located an elongated support member 22 so that this support member is positioned generally parallel to the slot 20. An elongated bar 24 is mounted on the housing 12 so as to project through the slot 22, and so that a series of elongated projections 26 formed thereon project upwards generally toward the center of this slot.



Upon each of the projections 26 there is positioned a key or arm 28 so that an elongated recess 30 within the bottom of each of these keys fits over one of the projections 26. The recesses 30 are preferably of larger cross-sectional dimension than the projections 26 so that the keys 28 are capable of being rotated about these projections during the operation of the instrument 10. Thus in effect the projections 26 may be termed "fulcrums". The lengths of the recesses 30 and of the projections 26 are preferably the same so as to hold the keys 28 against movement along the length of the slot 20.

The keys themselves normally are located as shown in Fig. 3 of the drawings so that portions of them rest against the support member 22. As is best seen in the drawings, the extremities of the keys 28 furthest removed from the housing 12 are, in this position, spaced from the ledge 16 so that a child or other individual playing the instrument 10 can push upon any of the keys 28 rotating the key so actuated about a projection 26 in order to bring a tone bar 32 into engagement with the means for actuating this tone bar. The tone bars 32 are, with the preferred construction of the invention, formed so as to each include two openings 34 located therein so that these tone bars may be supported in notches 36 on resilient rubber supports 38.

These supports 38 fit over cylindrical projections 40 formed on the keys 28 as shown in Fig. 5. Thus, the supports 38 resiliently hold the tone bars 32 upon the keys 28 so these tone bars are free to vibrate.

The tone bars 32 can be conveniently formed out of a number of commonly available materials such as stainless steel, aluminum or the like; they are so proportioned in size and dimension to produce a series of notes when the keys 28 are actuated. It is necessary that the supports 38 be formed out of a resilient material such as rubber or the like, if the vibrations produced by the tone bars 32 are not to be transmitted through the keys 28 when the instrument 10 is played. These keys may be conveniently formed out of wood or any common material such as polystyrene or the like, with a minimum of difficulty. In the preferred mode of manufacturing of the instrument 10, the tone bars 32 are assembled upon the keys 28 prior to the insertion of these keys within the housing 12.

The means for actuating the tone bars 32 so as to produce sound in the instrument 10 preferably comprise a plurality of percussion rings 42 formed out of metal or the like. These rings 42 are rotatably mounted upon projections 44 on arms 46 secured to a shaft 48; the rings 42 are prevented from coming off of the projections 44 by means of enlarged ends 50 on these projections. The shaft 48 is carried by bearings 52 secured to the housing 12;

this shaft is adapted to be driven through a belt and pulley arrangement 54 by means of an electric motor 56 disposed within the housing 12. A switch 58 is attached to the front side 14 of the housing 12 in order to turn this motor on and off. If desired, the motor can be of the category which may be operated by household current supplied to the instrument 10 through an electric cord (not shown) or, if desired, this motor 56 may be actuated by conventional electric batteries 60 disposed in a battery cavity 62 within the housing 12. Internal wires 64 are employed to connect the batteries 60, the motor 56 and the switch 58 in a conventional manner.

It will be noted from an examination of Figs. 2 and 3 of the drawings that the arms 46 preferably project radially from the shaft in different directions. This is so that as the instrument 10 is played that the various rings 42 do not strike one or more of the tone bars 32 simultaneously so as to obtain a more pleasing musical effect than if all of the tone bars were actuated at one time.

The actual operation of the instrument 10 is relatively simple. A child merely presses upon one or more of the keys 28 bringing the tone bar 32 attached to each key so actuated into an upper position in which this tone bar is so spaced with respect to the shaft 48 that it is capable of being engaged by a ring 42. As

the shaft turns, any such ring periodically engages the corresponding tone bar causing sound to be produced by this tone bar. In effect, a tremolo effect is thus produced. This tremolo effect achieved with the present invention closely resembles the tone which is obtained by an electric organ, and it is considered to be pleasing.

The use of the percussion rings 42 in the instrument 10 noted. During the operation of the instrument these rings 42 are rotated about the projections 44 through engagement with the corresponding tone bars 32; also these rings can move slightly upon the projections 44 so that as they strike a tone bar a sharp blow is not applied to the tone bar, but instead the tone bar is actuated in a more gentle manner so as to produce vibrations. Thus, with this construction no sounds resembling the hitting of an anvil with a hammer result; the only musical tone noticed is one corresponding to the desired tone produced by a tone bar.

When it is desired to reinforce the tones produced by a tone bar 32 after the key 28 has been released, it is possible to dispose resonating columns 66 upon the keys 28 in the manner indicated in Fig. 3 of the drawing. The columns 66 are held within openings 68 in the keys 28 by an adhesive or other equivalent means. Each of the columns 66 has an open end 70 spaced from the center of a tone bar 32, and has a closed end 72 remote from this tone bar. The columns 66 appear as common tubes or cylinders.

The sizes of the column 66 are, of course, varied. In general the larger the tone bar 32, the longer the column 66 disposed beneath it is. These columns 66 are of such a dimension so as to effectively reinforce the tones or notes generated by vibration of corresponding tone bars 32. Because of the fact that the tone bars 32 are mounted on the keys 28 so as to be permanently spaced with respect to the resonating columns 66, the operation of these resonating columns is unaffected by the movement of the keys 28.

If desired, it is possible to provide a toy musical instrument 80 as shown in Fig. 4 of the drawing in which tone reinforcement by a resonating column varies as the instrument is played. Since the instrument 80 is identical with the instrument 10 previously described except for the resonating column structure the various identical parts of the instrument 80 are shown in the drawing designated by the primes of the numerals previously employed.

In the instrument 80 resonating columns 82 are employed instead of the columns 66 previously indicated. These columns 82 are graduated as to size in the same manner as the columns 66, and are provided with open ends 84 adjacent to, and above the ends of corresponding tone bars 32', and are provided with closed ends 86. With this construction as a key 28' is rotated so as to move the tone bar 32' attached to it so that this tone bar

is engaged by a ring 42' in order to produce sound the spacing between this tone bar 32' and the corresponding column 82 is changed. As long as a key 28' is held so that its tone bar 32' is engaged by a maximum amount of sound reinforcement by the corresponding column 82 occurs. When the key 28' is released the spacing between the tone bar 32' held by it and this resonating column increases, and the amount of sound reinforcement by the column 82 decreases quite rapidly because of this.

Those skilled in the art to which this invention pertains will realize that a large number of modifications may be made in the structures shown without departing from the essential nature of this invention. For this reason, the invention is to be considered as limited only by the appended claims forming a part of this description. Those skilled in the art to which this invention pertains will also realize that the various structures indicated herein are each very efficient to the purpose intended, are easily and cheaply manufactured, and are comparatively rugged. They will also realize that these structures are capable of producing pleasing sounds when actuated by a child.

This application is a continuation in-part of the co-pending application Serial No. 561,420 filed January 26, 1956 entitled TOY MUSICAL INSTRUMENTS. The subject matter of this co-pending application is incorporated herein by reference.

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CLAIMS:

1. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a key support ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within said housing, said keys being capable of being engaged on the outside of said housing so as to be pushed into engagement with said key support ledge so as to rotate said keys about said projections to a playing position; a tone bar resiliently attached to each of said keys so as to be moved to a playing position when said keys are moved to a playing position; a shaft rotatably mounted within said housing above said tone bars, said shaft being generally parallel to said slot; means operatively associated with said shaft and mounted in said housing for

rotating said shaft; a plurality of arms attached to said shaft so as to project therefrom, each of said arms being located generally above one of said tone bars; means operatively associated with each of said arms for periodically striking one of said tone bars when said keys are actuated so as to rotate about said projections to a playing position.

2. A toy musical instrument as defined in claim 1 wherein said arms project radially from said shaft and wherein said arms are spaced about said shaft so as to project from said shaft in different directions.

3. A toy musical instrument as defined in claim 1 including a projection attached to each of said arms at an extremity remote therefrom, each of said projections having an enlarged end thereon; and wherein each of said means attached to said arms comprises a ring positioned on one of said projections, said rings being held on said projections by said enlarged ends and being capable of rotation about said projections.

4. A toy musical instrument as defined in claim 1 including a resonating column mounted adjacent to each of said tone bars, each of said resonating columns having an open end located immediately adjacent to one of said tone bars.

5. A toy musical instrument as defined in claim 4 wherein each of said resonating columns is mounted upon one of said keys.

6. A toy musical instrument as defined in claim 4 wherein said resonating columns are mounted on said housing.

7. A toy musical instrument of the class described which includes: a housing having a front side formed with an elongated slot located therein; a ledge attached to said front side of said housing so as to project generally parallel to said slot; a plurality of projections capable of serving as fulcrums mounted on said housing adjacent to said slot so as to project upwards from the lower edge thereof; a support member positioned within said housing so as to project generally parallel to said slot; a plurality of keys, each having a top and a bottom and a recess located in the bottom thereof positioned so as to project through said slot into said housing with each of said recesses receiving one of said projections, said keys being supported in a normal position by said projections and said support member located within saidhousing, said keys being capable of being engaged on the outside of said housing so as to be pushed into engagement with said key support ledge so as to rotate said keys about said projections; means extending upwards from each of said keys within said housing; resilient means located above each of said keys with respect to said means projecting upwards from

said keys; a tone bar positioned upon said resilient means above each of said keys, each of said tone bars being held closely against lateral movement by said means projecting upwards from each of said keys; a shaft rotatably mounted within said housing above said tone bars, said shaft being generally parallel to said slot; means mounted in said housing for rotating said shaft; a plurality of arms attached to said shaft so as to project therefrom, each of said arms being located generally above one of said tone bars; means attached to each of said arms for striking one of said tone bars when said keys are actuated so as to rotate about said projections.

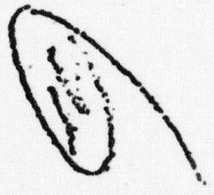
8. A toy musical instrument as defined in claim 7 wherein said arms project radially from said shaft and wherein said arms are spaced about said shaft so as to project from said shaft in different directions.

9. A toy musical instrument as defined in claim 7 including a projection attached to each of said arms at an extremity remote therefrom, each of said projections having an enlarged end thereon; and wherein each of said means attached to said arms comprises a ring positioned on one of said projections, said rings being held on said projections by said enlarged ends and being capable of rotation about said projections.

10. A toy musical instrument as defined in claim 7 including a resonating column mounted adjacent to each of said tone bars, each of said resonating columns having an open end located immediately adjacent to one of said tone bars.

11. A toy musical instrument as defined in claim 10 wherein each of said resonating columns is mounted upon one of said keys.

12. A toy musical instrument as defined in claim 10 wherein said resonating columns are mounted on said housing.



REFERENCES CITED

The following references are of record in the patented file of this patent:

UNITED STATES PATENTS

Name	Number	Date
Deagan	1,293,722	Feb. 11, 1919
Marks	2,052,890	Sept. 1, 1936
Lohr	2,279,143	Apr. 7, 1942
Alvarez	2,486,545	Nov. 1, 1949
Sjolander	2,508,300	June 6, 1950
Fleury	2,510,094	June 6, 1950
Zimmerman	2,541,143	Feb. 13, 1951
Duncan	2,759,387	Aug. 21, 1956
Alvarez	2,799,196	July 16, 1957
[illegible]	[illegible]	[illegible]

FOREIGN PATENTS

Country	Number	Date
Germany	567,657	Apr. 6, 1933

OTHER REFERENCES

OATH, POWER OF ATTORNEY, AND PETITION

Being duly sworn, I, CLAIR OMAR MUSSER, depose and say that I am a citizen of the United States of America residing at Studio City, California; that I have read the foregoing specification and claims and I verily believe I am the original, first and sole inventor of the invention or discovery in TOY MUSICAL INSTRUMENTS described and claimed therein; that this application is a continuation-in-part of prior patent application Serial No.561,420, filed January 26, 1956; that as to the subject matter of the present application which is common to said prior patent application I do not know and do not believe that the same was ever known or used, or patented or described in any printed publication, in any country before my invention or discovery thereof, or more than one year before said prior application, or in public use or on sale in the United States for more than one year before said prior application; that said common subject matter has not been patented in any country foreign to the United States on an application filed by me or my legal representatives or assigns more than twelve months before said prior application; and that no application for patent on said common subject matter has been filed by me or my representatives or assigns in any country foreign to the United States; that as to the subject matter of the present application not common to the prior application, I do not know and do not believe that the same was ever known or used, or patented or described in any printed publication, in any country before my invention or discovery thereof, or more than one year prior to the present application, or in public use or on sale in the United States for more than one year prior to the present application; that said not-common subject matter has not been patented in any country foreign to the United States on an application filed by me or my legal representatives or assigns more than twelve months prior to the present application; and that no application for patent on said not-common subject matter has been filed by me or my representatives or assigns in any country foreign to the United States.

And I hereby appoint Edward D. O'Brian, 541 South Spring Street, Los Angeles 13, California, Reg. No. 17,144, my attorney with full power of substitution and revocation, to prosecute this application and transact all business in the Patent Office connected therewith.

Wherefore I pray that Letters Patent be granted to me for the invention or discovery described and claimed in the

OCT 29 1958

foregoing specification and claims, and I hereby subscribe my name to the foregoing specification and claims, oath, power of attorney, and this petition, this 8th day of October, 1958.

Clair Omar Musser

Inventor

12997 Blairwood Drive
Studio City, California

STATE OF CALIFORNIA)
) SS:
COUNTY OF LOS ANGELES)

Before me personally appeared CLAIR OMAR MUSSER to me known to be the person described in the above application for patent, who signed the foregoing instrument in my presence, and made oath before me to the allegations set forth therein as being under oath, on the day and year aforesaid.

Caroline N. Kehm

Notary Public

My Commission Expires July 25, 1960

SEAL

FORM PO-98a
(12.17.56)

U.S. DEPARTMENT OF COMMERCE
PATENT OFFICE

CUMULATIVE REFERENCE LIST

Patents Made of Record:

Deagan	1,293,722	Feb. 11, 1919	84-410
Marks	2,052,890	Sept. 1, 1936	84-404 XR
Lobo	2,279,143	Apr. 7, 1942	84-404
Alvarez	2,486,545	Nov. 1, 1949	84-1.15
Stolander	2,508,300	June 6, 1950	84-257
Fleury	2,510,094	June 6, 1950	84-404
Zimmerman	2,541,143	Feb. 13, 1951	84-404
Duncan	2,759,387	Aug. 21, 1956	84-404
Alvarez	2,799,196	July 16, 1957	84-1.04
Bienengraber	567,657	April 6, 1933	84-404
(Germany)	(1 sht. drwg. 1 pg. spec.)		

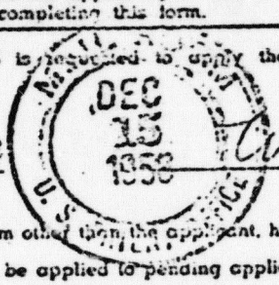
POL-L-A
8-26-58

Patent Office

FINAL FEE TRANSMITTAL

This form is provided for convenience in transmitting final fees to the Patent Office. When properly completed it may be used in lieu of a formal transmittal letter. Respondents will note and fill in items numbered 1 thru 6 below. The Final Fee Receipt, in all cases, will be mailed to the address appearing in box at lower left of this form. If desired, use the reverse side of your Notice of Allowance for carbon copy when completing this form.

1. The COMMISSIONER OF PATENTS is requested to apply the accompanying fee to the case identified below, and deliver the patent as indicated.



Dec. 15, 1958 — William L. Mathis
Date — Attorney, Agent or Applicant

NOTE-- Final fees will not be received from other than the applicant, his assignee, or attorney, or a party in interest as shown by the records of Patent Office. Final fees will not be applied to pending applications.

	FILING DATE	SERIAL NO.	NO. CLAIMS ALLOWED	EXAMINER
	10/20/58	767061	12	C. W. Robinson
APPLICANT	Musser, Clair Omar, Studio City, Calif.			MAILED Dec. 12, 1958
ASSIGNEE				
TITLE OF INVENTION	Toy piano having key mounted tone bars			Notice of Allowance Date

2. DEFERMENT: (Indicate below if desired)

3. FEE ENCLOSED

$ 30.00

4. Assignee: (If assigned and name does not appear in the corresponding space above)

MAILING INSTRUCTIONS

Note—The office will send the patent to the address entered in stub at left below unless you direct otherwise. Use the spaces provided to indicate any changes which affect the delivery of the patent.

5. Do not send the patent to the addressee listed below. Send patent to (check one)

☐ Patentee

☐ Assignee

☒ Associate Attorney (See specific authorization in file)

☐ Change of address—Attorney

The address of the person checked above is typed in Item 6 below.

William Mathis
1435 G St., N. W.
Washington, D. C.

#4

FORM PO-122 (9-1-50) U. S. DEPARTMENT OF COMMERCE PATENT OFFICE

5

TITLE REPORT

NO. 767,081 c.p.

NAME Clair O. Musser

THE TITLE APPEARS FROM THE ASSIGNMENT RECORDS TO BE VESTED IN:

inventor

EXAMINED UP TO AND INCLUDING Oct. 27, 1958

THIS CERTIFICATE DATED Nov. 24, 1958

[redacted]

HEAD OF ASSIGNMENT BRANCH

NO FURTHER ASSIGNMENTS APPEAR TO HAVE BEEN RECEIVED FOR RECORD INCLUDING:

COMM-DC 67106

POL-85
8-26-58

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON 25, D. C.

U. S. DEPARTMENT OF COMMERCE
PATENT OFFICE
WASHINGTON

All communications respecting this application should give the serial number, date of filing, and name of the applicant.

NOTICE OF ALLOWANCE

The application for patent identified below has been examined and found allowable for issuance of Letters Patent.

	FILING DATE	SERIAL NO.	NO. CLAIMS ALLOWED	EXAMINER
	10/20/56	767061	12	C. W. Robinson
APPLICANT	Musser, Clair Omar, Studio City, Calif.			MAILED Dec. 12, 1956
ASSIGNEE				
TITLE OF INVENTION	Toy piano having key mounted tone bars			

With[illegible]wance of the application the final fee becomes due. This fee is thirty dollars ([illegible]) plus one dollar ($1) for each claim allowed in excess of twenty (20) and must be paid within 6 months from the date of this notice. Failure to remit the final fee will result in the patent being withheld from issue.

As a convenience in remitting this fee, use of the enclosed Form POL-85a is suggested. The final fee will not be received from anyone other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

If it is desired to have the patent issued to an assignee or assignees, an assignment, together with the fee for recording the same, must be filed in this Office on or before the date of payment of the final fee.

The patent will be issued and forwarded within approximately two months after receipt of the final fee.

By direction of the Commissioner.

William Mathis
1435 G St., N. W.
Washington, D. C.

NOV - 3 1953
PATENT OFFICE

IN THE UNITED STATES PATENT OFFICE

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C. O. MUSSER

SERIAL NO.: 767,081

FILED: OCTOBER 20, 1958

FOR: TOY MUSICAL INSTRUMENTS:

DIVISION 5

APPOINTMENT OF ASSOCIATE ATTORNEY

Hon. Commissioner of Patents
Washington 25, D.C.

Sir:

Please recognize William Mathis, c/o Swecker & Mathis, 1435 G. Street, N.W., Washington5, D.C., Reg.No.____ as associate attorney in the above noted application and direct all future correspondence with respect to this application to him at the above address.

Very truly yours,

Edward D. O'Brian

October 29,1958

2C-37

ADDRESS ONLY THE COMMISSIONER OF PATENTS WASHINGTON 25, D. C.

U. S. DEPARTMENT OF COMMERCE
PATENT OFFICE
WASHINGTON

All communications respecting this application should give the serial number, date of filing, and name of the applicant.

BC PAPER NO. 5/a

William Mathis
c/o Swecker & Mathis
1435 G St., N.W.
Washington 5, D.C.

Applicant: Clair Omar Musser	
Ser. No. 767,081	
Filed Oct. 20, 1958	DEC 5 1958
For TOY PIANO HAVING KEY MOUNTED TONE BARS	

Please find below a communication from the EXAMINER in charge of this application.

Robert C. Watson
Commissioner of Patents.

The changes hereinafter specified have been made in the application identified above in accordance with the provisions of Order Number 3141 of February 4, 1930, (Manual of Patent Examining Procedure 1302.04), which reads in part as follows:

> Other obvious informalities in the application may be corrected by the examiner, but such corrections must be in the form of an amendment, approved and signed by the Principal Examiner, placed in the file, and made a part of the record. A copy of the amendment is sent to the applicant. The changes specified in the amendment will be entered by the clerk in the regular way.

If these changes are not satisfactory to the applicant, an appropriate amendment may be proposed under the provisions of Rule 312, provided the printing of the specification has not begun at the time such amendment is ready for entry. To insure the consideration of such amendment for inclusion, it should be submitted on or before the date of remitting the final fee since the printing of the specification begins a few days thereafter.

The application has been amended as follows:

The following patents are made of record:

Deagan	1,293,722	Feb. 11, 1919	84-410
Marks	2,052,890	Sept. 1, 1936	84-404 xr
Lohr	2,279,143	Apr. 7, 1942	84-404
Alvarez	2,486,545	Nov. 1, 1949	84-1.15
Sjolander	2,508,300	June 6, 1950	84-257
Fleury	2,510,094	June 6, 1950	84-404
Zimmerman	2,541,143	Feb. 13, 1951	84-404
Duncan	2,759,387	Aug. 21, 1956	84-404
Alvarez	2,799,196	July 16, 1957	84-1.04
Biemengraber (Germany)	567,657 (1 sht.drwg., 1 pg. spec.)	Apr. 6, 1933	84-404

On page 9, line 3, "colymn" has been changed to column.

The title has been changed to "Toy Piano Having Key Mounted Tone Bars".

Prosecution on the merits is closed.

The Notice of Allowance will be mailed in due course.

USCOMM-DC-30025

174

July 16, 1957 O. J. ALVAREZ 2,799,196

ELECTRICAL MUSICAL INSTRUMENT

Filed Nov. 12, 1952 3 Sheets-Sheet 1

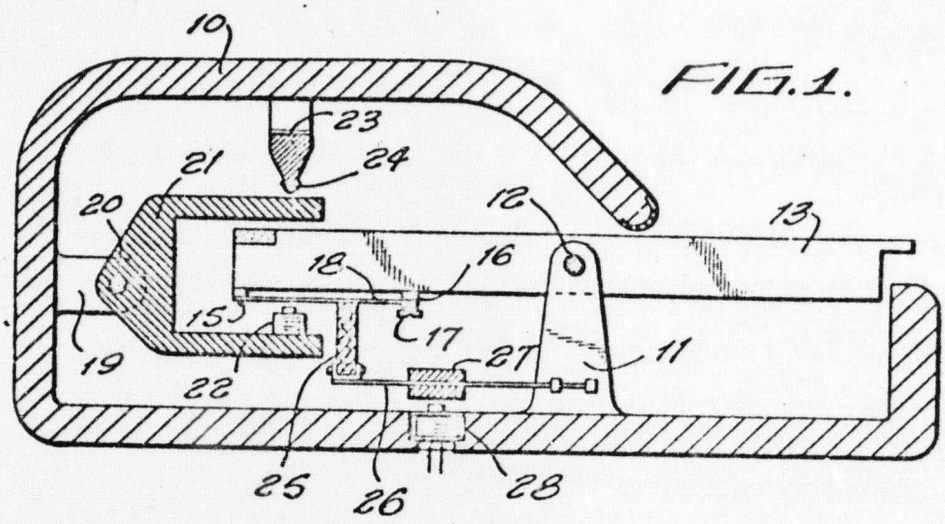

FIG. 1.

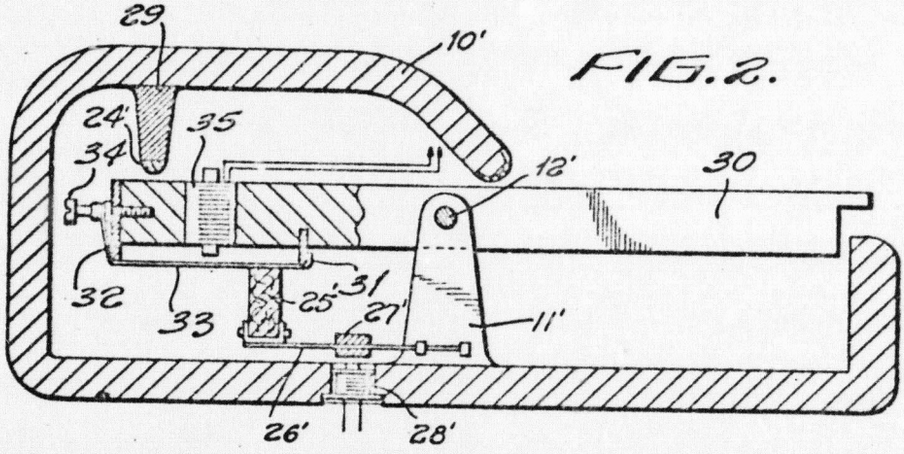

FIG. 2.

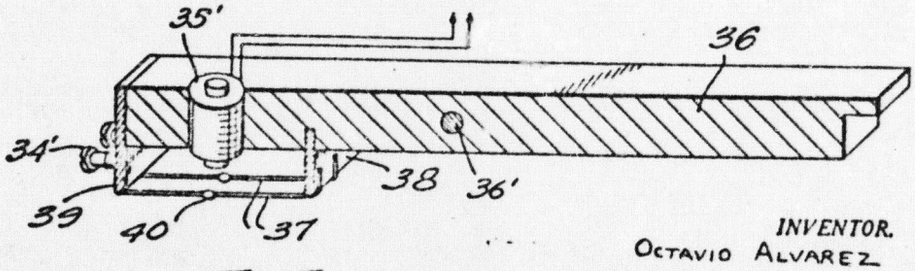

FIG. 3.

INVENTOR.
OCTAVIO ALVAREZ
BY
Mitchell & Sturm
Agt

July 16, 1957 O. J. ALVAREZ 2,799,196

ELECTRICAL MUSICAL INSTRUMENT

Filed Nov. 12, 1952 3 Sheets-Sheet 2

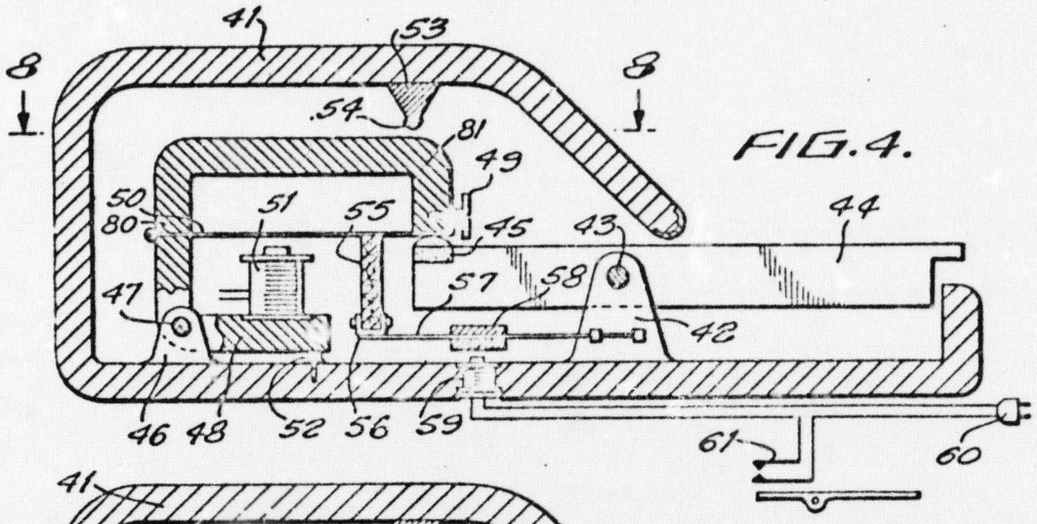

FIG. 4.

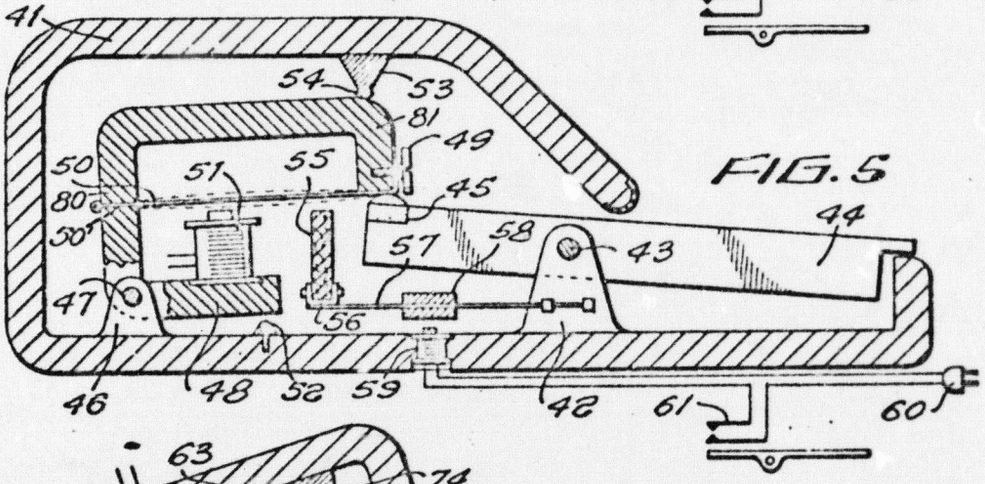

FIG. 5

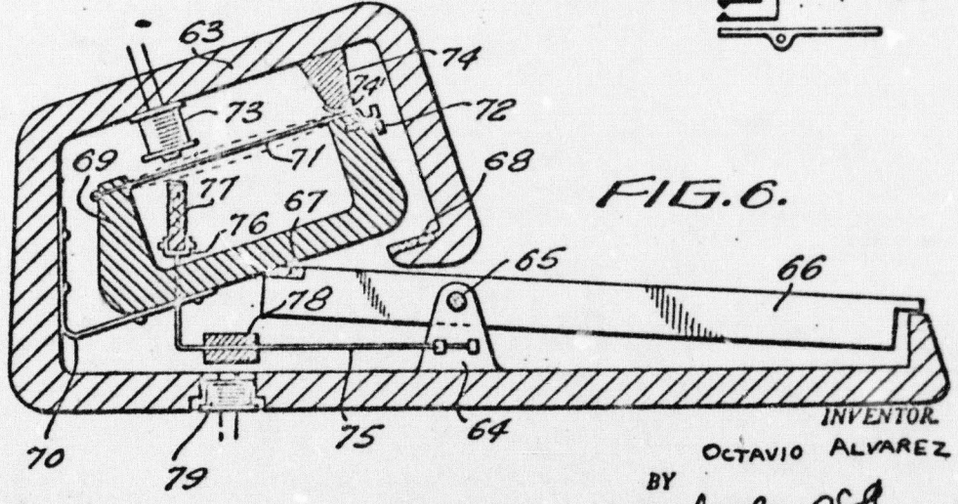

FIG. 6.

INVENTOR
OCTAVIO ALVAREZ
BY

176

July 16, 1957 O. J. ALVAREZ 2,799,196

ELECTRICAL MUSICAL INSTRUMENT

Filed Nov. 12, 1952 3 Sheets-Sheet 3

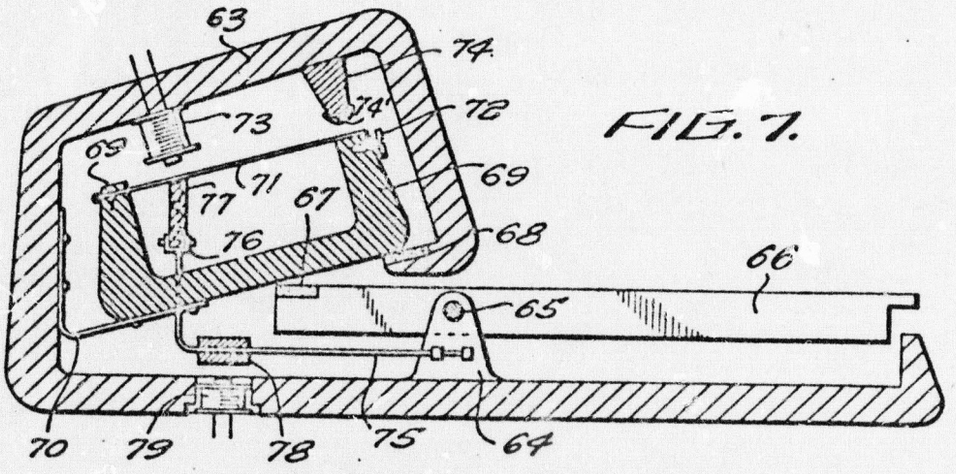

FIG. 7.

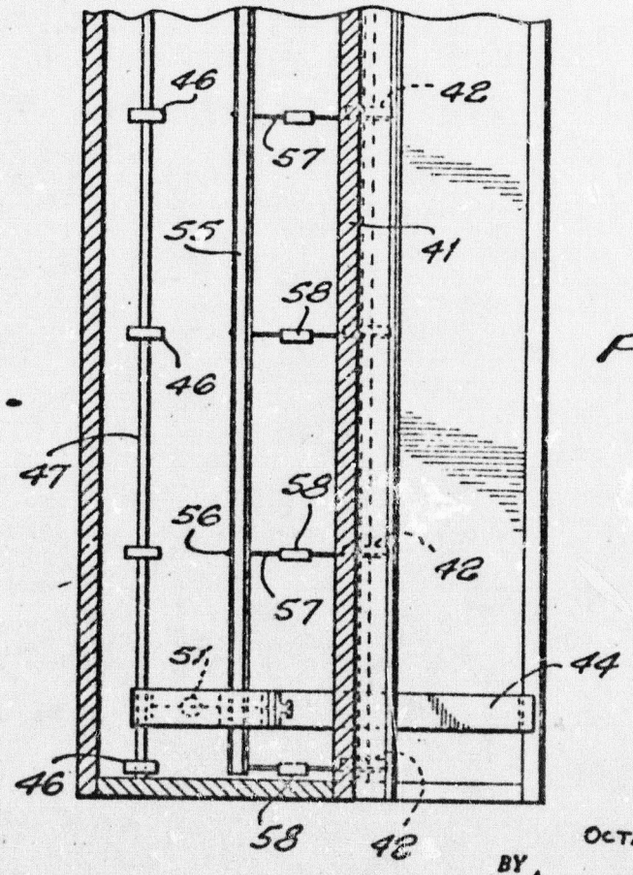

FIG. 8.

INVENTOR.
OCTAVIO ALVAREZ
BY

United States Patent Office

2,799,196

Patented July 16, 1957

2,799,196

ELECTRICAL MUSICAL INSTRUMENT

Octavio Jose Alvarez, New York, N. Y.

Application November 12, 1952, Serial No. 320,035

16 Claims. (Cl. 84—[illegible])

The present invention relates to musical instruments and in particular to stringed instruments.

A structure similar to that of the present invention is disclosed in U. S. Patent No. 2,486,545. The structure of this patent produces the sound by a vibrating steel reed which is associated with two sets of stationary coils.

One of the objects of the present invention is to provide a musical instrument with vibrating strings and a means for electrically picking up the vibrations of the strings to transform these vibrations into audible sounds.

A further object of the present invention is to provide a single set of coils to pick up the vibrations of the strings both when an operating key or the like has been depressed and when it is released.

Another object of the present invention is to provide a means for mounting the coils so that they are always in a predetermined relation with respect to the vibrating strings.

A still further object of the present invention is to provide a means for varying the tension of the vibrating strings.

Yet another object of the present invention is to provide a means for increasing the amplitude of the vibrations of the strings.

An additional object of the present invention is to provide an instrument capable of accomplishing all of the above objects while at the same time being made of relatively few, simple, ruggedly constructed parts.

With the above objects in view, the present invention mainly consists of a musical instrument which includes a support structure and a carrier structure mounted on the support structure for movement between a rest position and an operating position. A stop means is mounted on the support structure adjacent to the carrier structure and engages the latter when the carrier structure moves from its rest to its operating position, so as to impart vibrations to the carrier structure. An elongated vibrating member is fixed to the carrier structure and has two spaced points engaging the latter, this vibrating member being free between the spaced points thereof so as to vibrate between these points when the carrier structure strikes against the stop means upon movement of the carrier structure to its operating position. A pick-up means is provided on the carrier structure or the support structure and is located adjacent to the elongated vibrating member to pick up the vibrations thereof and transmit the same to an apparatus for changing the vibrations into an audible sound.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a side, sectional, partly diagrammatic view of one possible apparatus for carrying out the present invention;

Fig. 2 is a partly diagrammatic, side, sectional view of another apparatus for carrying out the present invention;

Fig. 3 is a side, sectional view of a different embodiment of a part of the structure of Fig. 2;

Fig. 4 is a partly diagrammatic, side sectional view of still another embodiment of the present invention;

Fig. 5 illustrates the structure of Fig. 4 in a position different from that shown in Fig. 4;

Fig. 6 is a partly diagrammatic, side sectional view of a still further embodiment of the present invention:

Fig. 7 illustrates the structure of Fig. 6 in a position different from that shown in Fig. 6; and

Fig. 8 is a partly diagrammatic plan view taken along the line 8—8 of Fig. 4 in the direction of the arrows.

Referring now to the drawings, Fig. 1 shows a support 10 which e. g. extends horizontally along the length of a piano, or the like, this support 10 being shown in a transverse, vertical, sectional view in Fig. 1. In Fig. 1 is shown one of a plurality of key assemblies of an electrical musical instrument of the keyboard type. At spaced points along the length of the support 10 there are a number of stationary ears 11 which carry an elongated rod 12 extending along almost the entire length of the support 10. A plurality of elongated members in the form of keys 13, e. g. equal in number to the number of keys of a standard key board, are turnably mounted between their ends on the rod 12, as illustrated, these keys being located in side by side relation along the rod 12 and each having an outer free end portion accessible through an opening in the support 10 to the fingers of the operator of the instrument. Thus, ears 11 and rod 12 form a mounting means mounting each elongated member 13 for pivotal movement.

At its inner free end portion, each key 13 has fixed to its underside a pair of rigid members 15 and 16 forming a pair of string supporting means, and a screw 17 threadedly engages the member 16. An elongated vibrating member in the form of a stretched string 18 is fixed at one end to the member 15 and at its opposite end to the screw 17 so that the tension of string 18 may be adjusted by turning of screw 17. The several strings 18 which are respectively located on the keys 13 may vary as to length, thickness, and tension in proportion to conventional piano strings. The strings 18 may be made of a magnetic metal for a purpose to be described below.

A number of stationary ears 19 are located along the support 10 and are fixed to the inner rear face thereof, these ears 19 carrying an elongated rod 20 which extends along almost the entire length of the support 10. A plurality of C-shaped members 21 are turnably mounted on the rod 20, as shown in Fig. 1, and are equal in number to the number of keys 13 and located in side by side relation along the rod 20 respectively in alignment with the several keys 13. Each of the C-shaped members 21 includes an upper and a lower arm respectively located on opposite sides of the inner free end portion of the key 13 aligned therewith.

As is apparent from Fig. 1, the lower arm of the C-shaped member 21 is located at a greater distance from the key 13 than the upper arm of member 21, and an electrical pick-up means in the form of a coil 22 is fixedly mounted on this lower arm and is located closely adjacent to the string 18. Each of the members 21 is provided with a coil 22, and these coils are all electrically connected to an amplifier and loud speaker (not shown), in the same way as the coils shown in U. S. Patent Number 2,486,545.

An elongated stop bar 23 forms an abutment means and is fixed to the underside of the top part of the supporting casing 10, this bar 23 extending along almost the

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entire length of the support 10. A strip of elastic material such as felt or the like 24 is fixed to the bottom side of the bar 23. Thus, upon turning of a key 13 in a clockwise direction about rod 12, as viewed in Fig. 1, the inner free end portion thereof will engage the top arm of the C-shaped member 21 and turn the latter in a counterclockwise direction, as viewed in Fig. 1, until the top arm thereof strikes against the bar 23 so as to transmit vibrations through the member 21 and key 13 to the string 18 mounted on the latter. It will be seen that the coil 22 moves with the member 21 so as to be located close to the vibrating string 18 to pick up and transmit the vibrations thereof to an apparatus for changing these vibrations into an audible sound. Thus, the members 13 and 21 form a carrier structure for the string 18 and coil 22, this carrier structure being movable from the rest position illustrated in Fig. 1 to an operating position where the C-shaped member 21 engages stop bar 23 to set up vibrations in the string 18.

A damping means is associated with the strings 18 for damping the vibrations thereof. This damping means takes the form of an elongated strip 25 of felt or the like which extends along the entire length of support 10 beneath the strings 18. The strip 25 is carried by wire springs 26 which are respectively fixed to the ears 11 so as to urge the strip 25 to the position shown in Fig. 1 where it engages the strings 18 to damp out the vibrations thereof when the parts resume their rest position shown in Fig. 1.

A member 27 of a magnetic material is fixed to each of the springs 26, and an electromagnet 28 is located beneath each member 27, these electromagnets being mounted in the bottom wall of the casing 10 and being electrically operable, in a manner described below, by a pedal of the instrument. This structure forms an electromagnetic means for controlling the damping means. When this pedal is depressed, the electromagnets 28 are energized and attract the members 27 so as to move springs 26 downwardly to locate the strip 25 at a position lower than that shown in Fig. 1. In this way, the vibration of strings 18 will not be damped when the electromagnets 28 are energized, so that the vibrations of strings 18 will be continued to produce a long, drawn out tone.

Fig. 2 of the drawings illustrates a different embodiment of a key assembly of the invention which is in all respects the same as that of Fig. 1 except for the features which are now described. As is apparent from Fig. 2, the C-shaped member 21 and the parts 19 and 20 associated therewith are eliminated. Instead, the abutment means in the form of stop bar 29, identical with stop bar 23, is located directly over the inner end portions of the elongated members or keys 30 to engage the latter and directly set up vibrations in the same, stop bar 29 carrying a strip 24' of elastic material similar to strip 24. A pair of plates 31 and 32 are fixed to each of the keys 30 of the embodiment of Fig. 2, these plates forming a pair of string supporting means spaced longitudinally of member 30, and a string 33 is fixed at one end to plate 31, extends around the lower edge of plate 32, and is jointed to a tuning screw 34 which passes through the plate 32 and threadedly engages a threaded bore in the key 30 so that the tension of string 33 may be adjusted by turning of screw 34. Thus, string 33 is stretched and extends between the pair of supporting means 31 and 32. A coil 35 is mounted directly on each key 30 opposite the free portion of string 33 located between the points thereof which engage the plates 31 and 32, so as to pick up the vibrations of the string 33 and transmit the same in the same way as was described above. Coil 35 thus forms a pick-up means carried by member 30 adjacent string 33, with a portion of pick-up means 35 located between the pair of supporting means 31 and 32. Except for these features, the structure of Fig. 2 is the same as that of Fig. 1, and it is evident that upon depression of the key 30, it will strike the bar 29 to produce vibrations in the string 33 which will be picked up by the coil 35. A damping or string engaging means 25', 26' and an electromagnetic means 27', 28' for moving this damping means, identical with those of Fig. 1, are associated with the strings 33, as shown in Fig. 2. Fig. 2 also shows the support 10' and the mounting means 11', 12' pivotally mounting member 30 between its ends for turning movement about a predetermined axis. String 33 and the pair of supporting means 31 and 32 therefor as well as abutment means 29, 24' are all located on the same side of this axis, the abutment means being located opposite an upper face of member 30 adjacent an end of the latter.

Fig. 3 of the drawings shows a different type of string arrangement adapted to be used with the keys 36 identical with key 30. According to Fig. 3, a pair of strings 37 are each fixed at one end to a supporting means in the form of a plate 38 fixed to and extending from the underside of elongated member or key 36. These strings 37 extend about the lower edge of another supporting means in the form of a plate 39 fixed to the end of key 36, and each string 37 is connected to a tuning screw identical with screw 34 of Fig. 2. A weight 40 is mounted on each of the strings 37 to increase the amplitude of the vibrations thereof. Fig. 3 shows the pivotal mounting means 36', the pick-up means 35', and the tuning means 34'. Thus, when the structure of Fig. 3 is used, in the apparatus of Fig. 2, for example, the vibrations picked up by the coil will be the combined vibrations of two strings, and moreover the amplitude of these vibrations will be increased by the weights 40. It is to be understood that the feature of providing a plurality of strings in association with one key and the feature of providing a weight on a string are usable with the embodiments of Figs. 1 and 2, as well as with the further embodiments of the invention described below.

Fig. 4 of the drawings illustrates a further embodiment of a key assembly of the invention which includes an elongated support 41 similar to the support 10 described above. A number of ears 42 are fixed to the bottom wall of support 10 above the length thereof and carry a rod 43 on which the keys 44 are pivotally mounted. Each key 44 carries at its inner end portion a cushion member 45.

A number of additional ears 46 are fixed to the bottom wall of the support 41 and carry a rod 47 upon which a plurality of C-shaped elongated members 48 are turnably mounted, these members 48 being equal in number to the number of keys 44 and being respectively aligned therewith. Thus elements 46 and 47 form a mounting means turnably mounting the elongated member 48. Each member 48 is provided with a top arm having a downwardly extending free end located in engagement with the cushion 45 and threadedly carrying a tuning screw 49. A string 50 is connected to this tuning screw, extends about the free end of the top arm of member 48 and is fixed to the latter after passing through hole 50' at a point opposite this free end of the top arm thereof to provide string 50 with a free portion which is adapted to vibrate. The portions 80 and 81 of member 48 thus form a pair of string supporting means spaced longitudinally of member 48 and located at the ends thereof. A coil 51 forms a pick-up means carried by member 48 and is fixed to the lower arm of each member 48 and located closely adjacent to the string 50 to pick up the vibrations thereof and transmit the same to a sound producing apparatus, in the same way as was described above. The support 41 carries a rest 52 which engages the underside of member 48 when the parts are in the rest position shown in Fig. 4.

A stop bar 53 forms an abutment means and is fixed to the underside of the top wall of support 10 and extends over all of the members 48, this bar 53 being provided with an elastic strip of felt or the like 54 along its under surface. Thus, upon depression of key 44 the C-shaped member 48 aligned therewith turns to the position shown in Fig. 5 and strikes against the stop bar

53 to set up vibrations in the string 50 which are picked up by the coil 51.

A damping means identical with that described above is provided to damp out the vibrations of the strings 50. This damping means includes the elongated strip 55 of felt or the like mounted on a channel member 56 which is carried by a number of wire springs 57 fixed to the ears 42 (Fig. 8). Only one key 44 and its associated structure is shown in Fig. 8 for the sake of clarity. The springs 57 urge the strip 55 to the position shown in Figs. 4 and 5 so that the strings 50 engage the strip 55 when the parts are located in the position of Fig. 4 so as to thereby damp out the vibrations of the strings 50.

A number of magnetic members 58 are respectively mounted on the springs 57, and a number of electromagnets 59 are located in the bottom wall of support 41 respectively beneath the members 58. Elements 58 and 59 form an electromagnetic means for controlling the string engaging or damping means 55—57. The coils of electromagnets 59 are connected to a source of electricity through a plug 60, and the circuit of these coils includes a switch 61 operable by a foot pedal 62 which, upon being depressed, closes the switch 61 to complete a circuit through the electromagnets 59 which thereby attract the members 58 and pull the springs 57 and the strip 55 therewith to a position lower than that shown in Figs. 4 and 5, so that when the parts are in the position of Fig. 4, the vibrations of the strings 50 will not be damped and the tone produced thereby will be continued and drawn out. The parts 60—62 described above are associated with the electromagnets 28 of the embodiments of Figs. 1 and 2 to operate the same in exactly the same way.

A further embodiment of the invention is illustrated in Figs. 6 and 7 where the elongated support 63 carries ears 64 spaced along its length. Bar 74 carries an elastic strip 74' of felt or the like. A rod 65 is supported by the ears 64, and the keys 66 are pivoted on the rod 65, each key 66 having at its inner end a cushion member 67. A cushion member 68 is also provided on the support 63.

A plurality of upwardly directed C-shaped members 69 are each carried by a leaf spring 70 which is fixed to the inner rear face of support 63 and urges the members 69 to the position shown in Fig. 7 where they abut against the cushion 68 and maintain the keys 65 in the horizontal position illustrated in Fig. 7. A string 71 is fixed to the left free end of each member 69, as viewed in Figs. 6 and 7, and extends across the same and about the opposite free end thereof where each string 71 is connected to a tuning screw 72 threadedly engaging the member 69 and being turnable to adjust the tension of each string 71.

A stationary pick-up coil 73 is mounted on the under surface of the top wall of support 63 in close proximity to the several strings 71, respectively, as is evident from Figs. 6 and 7. Also, a stop bar 74 is mounted on the underface of the top wall of support 63 opposite the right free end of member 69, as viewed in Figs. 6 and 7, so that when the key 66 is depressed, as shown in Fig. 6, the member 69 engages stop bar 74 to transmit vibrations to the string 71 which are picked up by the coil 73 and transmitted to an apparatus for changing the vibrations to an audible sound. The coils 73 are located close enough to the strings 71, when the parts are in the rest position shown in Fig. 7, to pick up the vibrations thereof after the key 66 is released.

A number of elongated wire springs 75 are respectively fixed to the several ears 64, two of these springs respectively being located at opposite ends of the row of C-shaped members 69 and the others of these wire springs each extending upwardly through a pair of adjacent members 69. The several springs support an upwardly directed, elongated channel member 76 which extends along almost the entire length of the support 63 and

which carries the felt strip 77 which engages the strings 71 when the parts are in the position shown in Fig. 7.

A number of magnetic numbers 78 are respectively mounted on the springs 75, and a number of electromagnets 79 are respectively located beneath the members 78 to attract the latter when the electromagnets 79 are energized so as to draw the springs 75 and the felt strip 77 therewith down to a position below that shown in Figs. 6 and 7 so that when the parts are in position of Fig. 7 the vibrations of the strings 71 will not be damped and the tone will therefore continue and be drawn out. The electromagnets 79 are energized by a structure identical with the parts 60—62 of Figs. 4 and 5. Thus, the embodiment of Figs. 6 and 7 is capable of accomplishing the same results as the above-described embodiments of the invention, although the pick-up coils 73 remain stationary.

It will be seen that in all embodiments of the invention the strings are shorter than the keys.

In the description above and in the claims which follow, the term "string" is intended to signify a metallic string for musical stringed instruments.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of musical instruments differing from the types described above.

While the invention has been illustrated and described as embodied in musical stringed instruments, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. An electrical musical nstrument of the keyboard type having a plurality of k y assemblies at least one of which comprises an elongat d member, mounting means mounting said member for urning movement, a pair of string supporting means on said member spaced longitudinally thereof, a stretched string extending between said pair of supporting means, abutment means adjacent a portion of said member spaced from said mounting means and adapted to be contacted by said member during turning movement thereof, and electrical pick-up means on said member adjacent said string.

2. A musical instrument as recited in claim 1, wherein said abutment means is located adjacent an end portion of said member.

3. A musical instrument as recited in claim 1, said instrument including damping means located adjacent said string for damping vibration thereof.

4. A musical instrument as recited in claim 1, wherein a portion of said pick-up means is located between said pair of string supporting means.

5. A musical instrument as recited in claim 1, wherein a weight is carried by said string for influencing the vibration thereof.

6. A musical instrument as recited in claim 1, said elongated member having upper and lower faces and said abutment means being directed toward one of said faces adjacent an end of said member.

7. A musical instrument as recited in claim 1, wherein a string engaging means is located adjacent said string between said pair of supporting means for engaging a portion of the string located between said pair of supporting means.

8. A musical instrument as recited in claim 1, wherein said abutment means is made at least in part of elastic material.

9. A musical instrument as recited in claim 1 and wherein said pick-up means is located between said pair of supporting means substantially nearer to one of said pair of supporting means than the other.

10. A musical instrument as recited in claim 1, wherein said member is a manually operable key and has a front end portion capable of being turned downwardly by the operator in order to cause said key to approach and engage said abutment means.

11. A musical instrument as recited in claim 10 and wherein said key has a pair of end faces and said mounting means is connected to said member between said end faces thereof.

12. A musical instrument as recited in claim 10, wherein said key is pivotally supported intermediate its ends.

13. A musical instrument as recited in claim 1, wherein said pair of string supporting means are respectively located at the ends of said elongated member.

14. A musical instrument as recited in claim 1, wherein said member is a manually operable key and wherein said mounting means pivotally supports said key intermediate its ends for turning movement about a predetermined axis, said pair of supporting means being located on one side of said axis.

15. A musical instrument as recited in claim 14, wherein said abutment means is located adjacent an end of said key.

16. A musical instrument as recited in claim 15 wherein said abutment means is located on the same side of said axis as said pair of supporting means.

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FIG. 1.

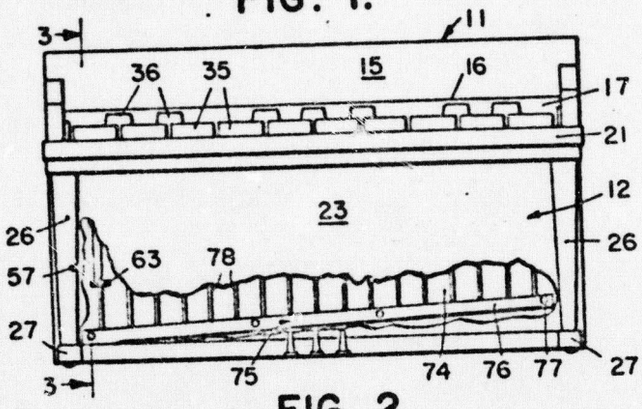

FIG. 2

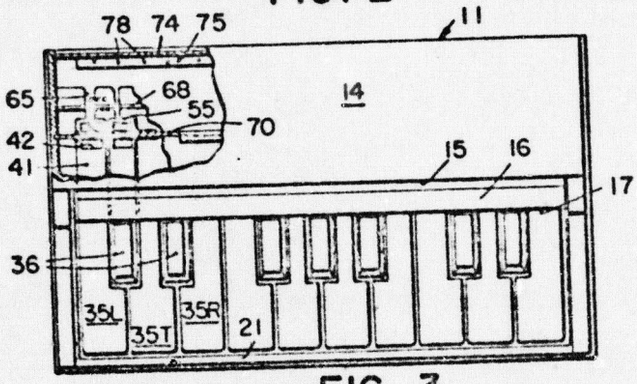

FIG. 3.

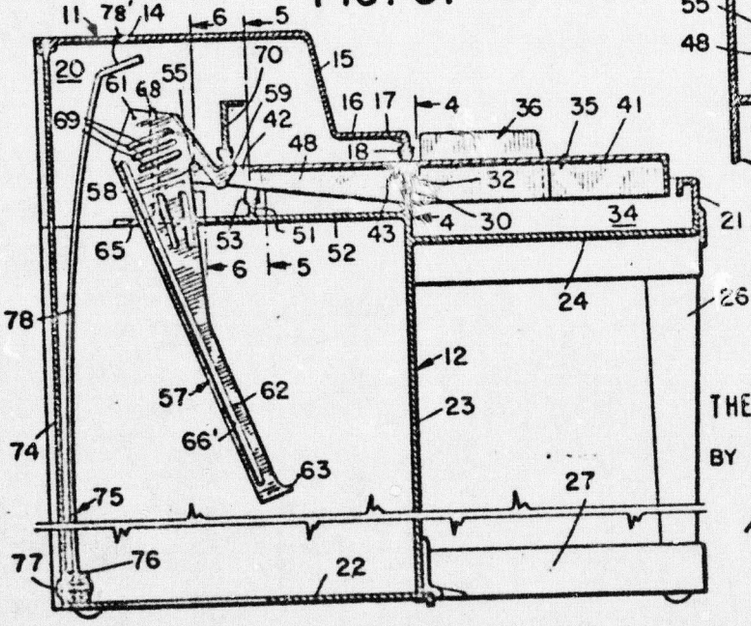

FIG. 4.

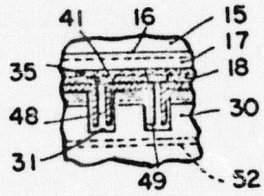

FIG. 5.

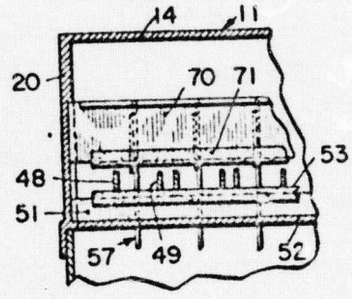

FIG. 6.

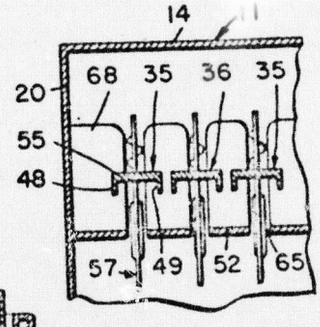

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FIG. 7.

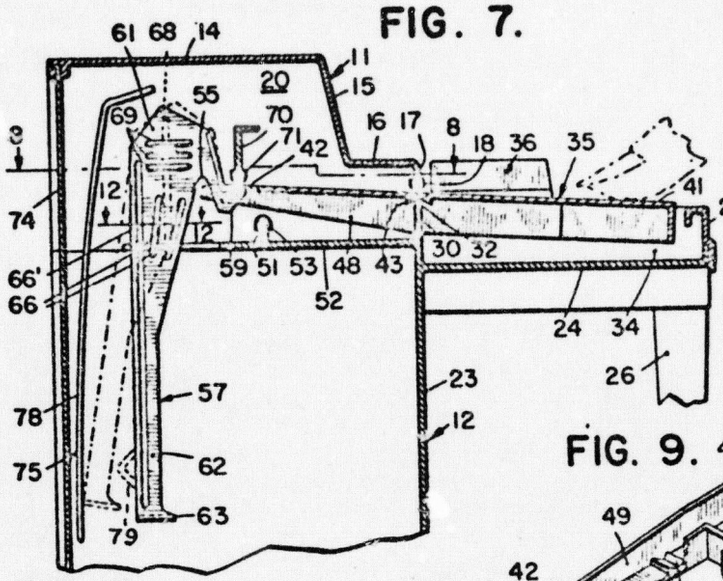


FIG. 12.

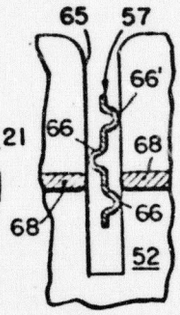


FIG. 9.

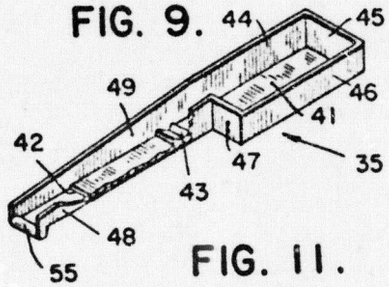


FIG. 8.

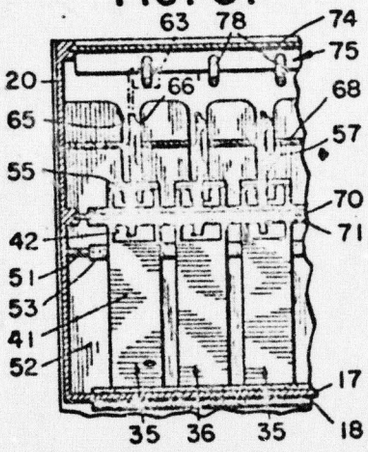


FIG. 11.

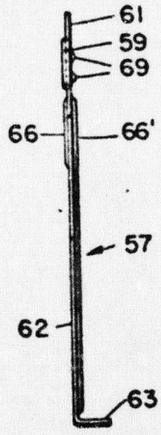


FIG. 10.

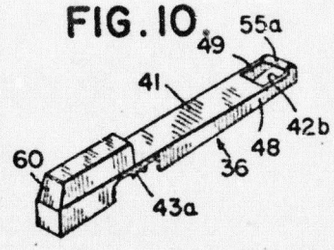


FIG. 14.

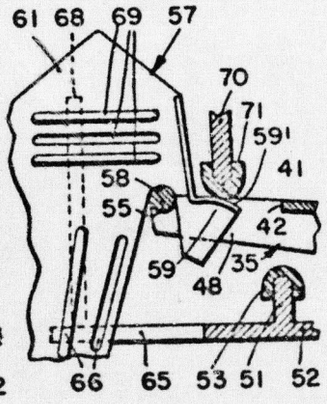
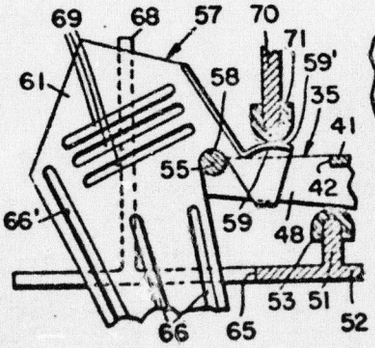


FIG. 13.



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the weight in the upper portion greatly contributes to the rapid action obtainable.

It will be apparent that the entire piano may be relatively light in weight with no unduly heavy parts which might tend toward breakage in transit. During shipment I may use a rod or bar of heavy paper, wood, or other material to hold the striking levers against movement. Such a bar, indicated by 79, is shown in broken lines in Fig. 7 and may extend through holes (not shown) in the ends of the case. The piano keys would be held depressed by any desired means in shipment.

Although the invention has been particularly shown and described, it is contemplated that various changes and modifications can be made without departing from the scope thereof as indicated by the following claims.

I claim:

1. In a piano, a case, a substantially horizontal key member pivotally supported intermediate its ends in said case for limited pivotal movement, a striking lever pivotally hung on the inner end of said key member and depending therefrom, said lever including an arm projecting toward the pivotal axis of said key member from the pivotal axis of the striking lever, said lever being relatively thin and flat and having a thin-edged striking head transversely of its lower end, the lower end portion of said lever being lighter in weight than the upper end portion, guide means in said casing for holding said lever in a vertical plane, and an abutment in the path of and engageable by the arm of said striking lever upon movement of said lever with said key member.

2. In a piano, a case, a substantially horizontal key member pivotally supported intermediate its ends in said case for limited pivotal movement, a striking lever pivotally suspended on the inner end of said key member and depending therefrom, the pivotal axis of said striking lever on said key being offset from the longitudinal axis of the lever whereby the lever normally hangs at a substantial acute angle to the vertical, said lever including an arm projecting toward the pivotal axis of said key member and away from the longitudinal axis of the striking lever, and an abutment in the path of and engageable by the arm of said striking lever upon movement of said lever with said key member, said abutment being so positioned that initial movement of the striking lever upon movement of said key member is in a direction such that the lower end of the striking lever swings downwardly toward the vertical.

3. In a piano, a case, an upright wall providing a plurality of fulcrum supports, a plurality of keys fulcrumed on said supports, means in said case limiting pivotal movement of said keys, a thin, substantially flat striking lever pivotally hung from the inner end of each key and having a lateral arm, said striking levers depending from said keys, an abutment engageable by the arms of said levers upon pivotal movement of the associated keys, and guide means in said case for maintaining said levers within narrow parallel planes, said means comprising a slotted shelf below the inner end portions of said keys receiving said levers and upright walls on said shelf between said slots.

4. In a piano, a case, a plurality of substantially horizontal key members, a plurality of striking levers pivotally suspended from the inner ends of the key members respectively, and wall means in said case defining guide slots for receiving said striking levers and maintaining them substantially parallel, said slots each being substantially wider than the thickness of the body of the individual levers, said levers having elongated convex bearing surfaces on their sides in the region of said slots for guiding the levers in said slots.

5. In a piano having a substantially horizontal key member mounted for limited pivotal movement about a horizontal axis intermediate its ends and having a striking lever abutment adjacent the inner end of said key member, the combination therewith of a striking lever comprising a thin, sheet-like body having an upper section formed to provide a downwardly facing notch at one side and an arm extending laterally of the notch, said lever being hung on the inner end of said key member by means of said notch with said arm positioned below said striking lever abutment, said striking lever body having a lower section terminating in a thin-edged, transversely extending striking head facing in a direction laterally opposite said arm, said lower section of said body being lighter than said upper section, said striking lever normally hanging from said notch substantially inclined with the lower end of the body relatively retracted.

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and 49. The configuration of the key as a whole, of course, will conform to one of the three types previously described, that is, it will either be an L-shaped key, a T-shaped key, or a reversely L-shaped key.

The keys are mounted or fulcrumed on the fulcrum wall sections 30 and the side walls 48 and 49 of the keys are received in the slots 31. The lower edges of the side walls are inclined upwardly as best shown in Figs. 3 and 7. The side walls rest on a vertical supporting wall 51 which is formed as part of a rearwardly extending shelf 52 in the lower part of the case and serves to limit downward movement of the inner ends of the keys. The upper part of the stop wall 51 is covered with a strip 53 of a yieldable rubber-like material to provide a cushioning means for the keys.

Each key at its inner end is provided with a cross member 55 which may preferably be rounded or circular in cross section to support a striking lever, generally indicated by numeral 57. The striking levers are provided with a notch 58 which receives the pin-like cross member 55 of the key, each lever being provided with an arm 59 formed to project toward the outer end of the key and be received within the hole 42 therein.

As shown in Fig. 10, the black keys 36 are of the same width throughout, having an elevated front finger portion 60. These keys also have the fulcrum bearing, indicated by 43*a*, the pin-like cross member 55*a*, and the hole 42*b*.

Each striking lever is preferably relatively light in weight and may be made of thin sheet metal or formed of plastic or other suitable material. The levers each comprise a wider upper section 61 which tapers to a relatively narrow lower end portion 62. A striking head 63 is formed at the lower end as by a portion of the material extending at right angles to the body of the member. The previously mentioned arm 59 extends laterally of the main portion of the upper section 61 somewhat below the notch. To provide greater bearing area, the upper edge 59' of the arm may be turned as shown.

In order to guide the striking levers and maintain them parallel the shelf 52 is slotted at 65 to receive the levers and each lever is provided with suitable corrugations 66 to act as bearings in the slot. One corrugation, 66', extends to the lower end of the lever to form a strengthening rib. The shelf 52 is also provided with a plurality of vertical guide walls 68 between which the upper ends of the striking levers extend. The striking levers are provided with horizontally disposed corrugations 69 in the region of these walls to act as bearings.

The striking levers are thus guided to be maintained in parallel planes independently of the key members. Hence the key members can be moved laterally somewhat without causing any misalignment of the striking levers. Also, by using relatively wide guide slots with guide corrugations on the levers, assembly and manufacture are facilitated and friction is reduced. Each of the striking levers is suspended and normally hangs in the position shown in Figs. 3 and 13 by reason of the the fact that it is pivotally supported or hung at a point offset from its longitudinal axis. Above the striking levers there is provided a vertical wall 70 which may be formed as a part of the upper part 11 of the case. This wall is provided with a resilient edging strip 71 of rubber or rubber-like material, and the wall acts as an abutment for the upper edges of the arms 59 of the striking levers. This wall 70—71 also acts as a stop for limiting movement of the keys.

In the rear portion of the case is mounted a sounding board 74 which supports a sound-producing element 75. If the case is of a so-called plastic, I prefer to use a metal sounding board to distribute the weight of the element 75 over a large part of the case. This element may be a music comb having a base 76, secured to the sounding board by rivets 77, and a plurality of elongated vibrators 78 which are firmly mounted in the base and free at their other ends. These vibrators may be made of music wire and slightly curved as shown to provide clearance between them and the sounding board for vibrating. This curve may be the natural curve of wire from coils, the amount of curvature being controlled by the diameter of the coils supplied by the wire manufacturer. The longer vibrators may have bent ends 78' so that the case need not be made unduly high to accommodate them. The sounding board is shown as including a lower apertured wall section 22 which serves as a bottom wall for the case.

Heretofore, in toy pianos employing vibrators fixed at one end and free at the other, it has been necessary to utilize relatively large, heavy vibrators which had to be reduced in cross section adjacent to the member in which they were anchored in order to permit them to vibrate satisfactorily on a desired partial. The vibrators were thus weakened near their point of mounting and consequently subject to breakage. Also, they were relatively expensive and difficult to tune.

I find that by employing high velocity striking levers of relatively light weight with small area of contact with the vibrators and striking the vibrators at the right point I can use relatively light-weight, thin vibrators of uniform cross section throughout their length. As indicated above the vibrators may be made of music wire and I have found that a wire having a diameter of .043 inch gives excellent results if it is struck at a point about 26.8% of its length from the anchored end. This appears to cause the vibrators to vibrate chiefly in two sections, or so-called "partials," giving a good tone. While the point defined appears to give best results, the striking point may be varied somewhat to each side without producing unsatisfactory results.

To enable the use of striking levers of the same length since the vibrators vary in length, increasing in length from one end to the other, I mount the comb with the base thereof inclined as shown in Fig. 11. This results in the desired striking points of the vibrators being disposed substantially in level alignment.

Another feature of the invention is the fact that the pivotal connection or fulcrum mounting of the striking levers on the inner ends of the keys (the long bearing surface 51 extending across the keys) permits the striking levers to be equally spaced without the necessity of having the inner ends of the keys centrally aligned with the striking levers. The spacing of the keys is thus somewhat independent of the spacing of the striking levers. An advantage of this is that the crowding of keys in the three black key groups, due to having only three types of white keys, does not require a similar crowding of the striking levers, as the spacing of the levers is even, while that of the keys is uneven. I am thus enabled to use merely three types of white keys (35L, 35T and 35R previously described) although on professional-type pianos it is customary to use seven types of white keys. Also, by having equally spaced striking levers, the levers may have wider striking heads and more space in which to operate and yet all be the same.

In the operation of the device, when a key is struck and depressed, as shown in Figs. 7 and 14, the inner end of the key rises, carrying the striking lever upwardly with it. Since the abutment wall 70—71 engages the upper surface 59' of the arm 59 on the upper end of the striking lever, the upward movement of the inner end of the key causes the striking lever to turn about its pivotal axis of suspension and, as a result, the lower end of the striking lever is rapidly propelled toward and against its associated vibrator, as shown by the broken-line position of Fig. 7. The movement of the key is limited by the abutment 70—71. After striking its associated vibrator, the striking lever bounces off the vibrator and hangs in the position in which it is shown in Figs. 7 and 14 until the key is returned to its original position. The fact that the striking levers are relatively light in weight with most

United States Patent Office

2,759,387

Patented Aug. 21, 1956

2,759,387

TOY PIANO

Theodore R. Duncan, North Hollywood, Calif.

Application May 11, 1950, Serial No. 161,460

5 Claims. (Cl. 84—404)

This invention has to do in a general way with pianos and particularly with small toy pianos.

I am aware that there are several different types of toy pianos on the market, but those with which I am familiar are relatively heavy, expensive to manufacture, and give very poor musical tone. One particular objection to such pianos is the fact that the music-producing elements are extremely heavy and clumsy, requiring a strong, heavy case. Breakage in shipment is common, and this ultimately adds to the cost of the pianos. Another fault with presently manufactured toy pianos is the fact that the "action" thereof is slow, making it impossible to rapidly repeat the same note. A further disadvantage is that the commonly employed clapper-type of striking means permits no expression in the music, and the sound of the music is often partially drowned out by the scraping and clanking sound of the action.

Therefore it is an object of my invention to provide a novel, improved toy piano which does not have the above-noted disadvantages of toy pianos presently manufactured.

A particular object of the invention is to provide a relatively small and light-weight toy piano which can be manufactured cheaply.

Another particular object of the invention is to provide a toy piano, which, compared to known toy pianos, has improved musical tone, quieter, more efficient and more responsive action, and is lighter in weight and more compact.

Another object is to provide a toy piano, which, as an article of manufacture, has a minimum number of parts easily assembled by unskilled persons, embodies a minimum of materials, utilizes the lowest cost materials suitable for each part, and which is easy to package and, though lighter in weight than those heretofore manufactured, is relatively stronger and less subject to breakage in shipment.

A further object is to produce a toy piano which has, in miniature, a quality of tone more like that of a true pianoforte.

A still further object is to provide improved means for striking the vibrators which avoids all individual felting and yet which will operate more silently and efficiently than known striking means.

A further object is to provide a unit tone-producing member of relatively light weight and improved design with a substantially straight, or level striking point.

A further object is to provide improved means for distributing the weight of the sound-producing member over a large area or portion of the case.

A particular object of this invention is to provide improved and simplified means for multiplying the velocity of the striking means in toy pianos, such devices, due to complexity and high cost of manufacture, having heretofore been used only on expensive professional pianos. In this connection it is an object to provide an ideally counterbalanced striking lever.

Another object is to provide a means for employing vibrators of uniform cross section fixed at one end and free at the other.

These and other objects will be apparent from the drawings and the following description thereof.

Referring to the drawings, which are for illustrative purposes only:

Fig. 1 is a front elevational view, partly broken away, of a toy piano embodying the invention;

Fig. 2 is a plan view of the device of Fig. 1, the view being partly broken away to show portions in sections;

Fig. 3 is an enlarged sectional view on line 3—3 of Fig. 1;

Fig. 4 is a fragmentary section on line 4—4 of Fig. 3;

Fig. 5 is a section on line 5—5 of Fig. 3;

Fig. 6 is a fragmentary sectional view on line 6—6 of Fig. 3;

Fig. 7 is a fragmentary sectional view in the same plane as Fig. 3 showing the parts with the key depressed;

Fig. 8 is a section on line 8—8 of Fig. 7;

Fig. 9 is a perspective view, partly broken away, of a white key member shown inverted;

Fig. 10 is a perspective view, partly broken away, of a black key member;

Fig. 11 is an edge view of the front of a striking lever;

Fig. 12 is an enlarged sectional view on line 12—12 of Fig. 7;

Fig. 13 is an enlarged fragmentary view of the upper end of the striking lever in the plane and position of Fig. 3; and

Fig. 14 is an enlarged fragmentary view of the upper end of the striking lever in the plane and position of Fig. 7.

More particularly describing the invention, in the drawings I show a piano of the spinet type which has a case which may be conveniently formed in two parts of plastic or other suitable material. The upper part is indicated by numeral 11 and the lower part by numeral 12. The upper part includes a top wall which is formed to provide an upper flat top section 14, an inclined section 15, a ledge 16, and a depending front wall flange 17, the lower edge of which is covered with a strip of a resilient or rubber-like material 18 for a purpose to be described. The upper part also includes end walls 20. The end walls extend forwardly of the flange wall 17 on each side and terminate in a key-enclosing front wall 21.

The lower part of the case includes a front wall 23 and a forwardly extending key space defining wall 24. The lower part of the case is also formed to provide legs 26 and parts 27 between the legs and the front wall 12.

The front wall 23 of the lower part of the case extends upwardly above wall 24 and terminates in a plurality of fulcrum sections 30 which, as shown in Fig. 4, are defined by slots 31 in the wall. These fulcrum sections may be tapered or beveled at 32 to form a sharp edge as shown. The upper part of the wall 23, the forward extending wall 24, and the front wall 21 of the upper part of the case cooperate to define a key space 34 for reception of the outer ends of piano keys 35 and 36.

As in conventional pianos both long, or white keys, 35 and short, or black keys, 36 are provided. When viewed in plan the exposed portions of the white keys are conventionally shaped, that is, they are slightly L-shaped as the key 35L, slightly T-shaped as the key 35T, or slightly reversely L-shaped as the key 35R, the keys being arranged as found on a conventional keyboard but being fewer in number.

The white keys each are in the form of an elongated box-like structure. Referring to Fig. 9, a typical white key comprises a top wall 41, which is provided with an aperture or opening 42 at the inner end of the key. On the under surface of the top wall a bearing element 43 is formed at the point where the key is to be fulcrumed on one of the sections 30. Each key is provided with side walls such as those shown at 44, 45, 46, 47, 48,

Feb. 13, 1951 H. ZIMMERMAN 2,541,143

TOY MUSICAL INSTRUMENT

Filed Sept. 11, 1948

Fig. 1.

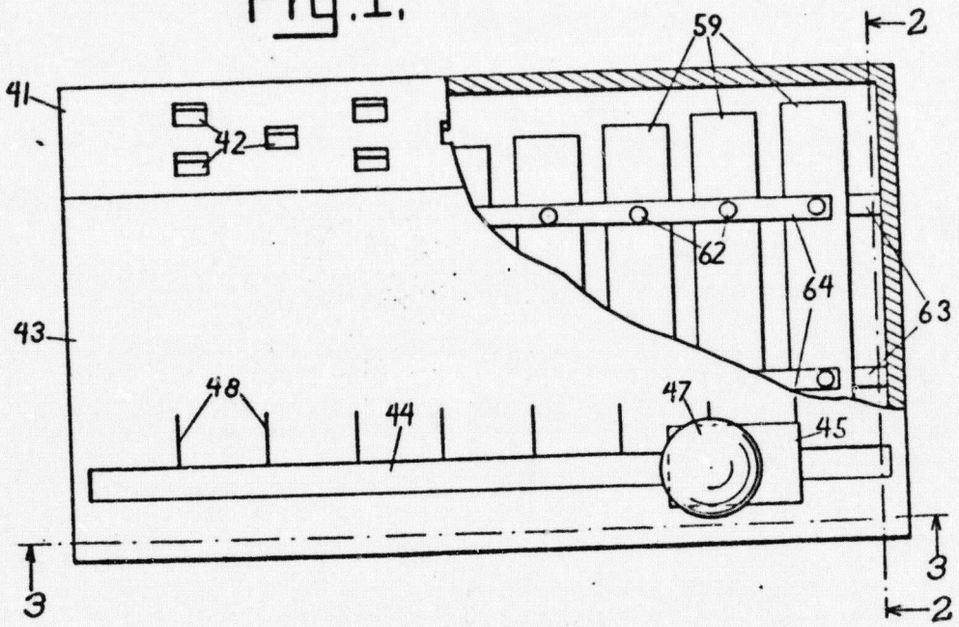


Fig. 2.

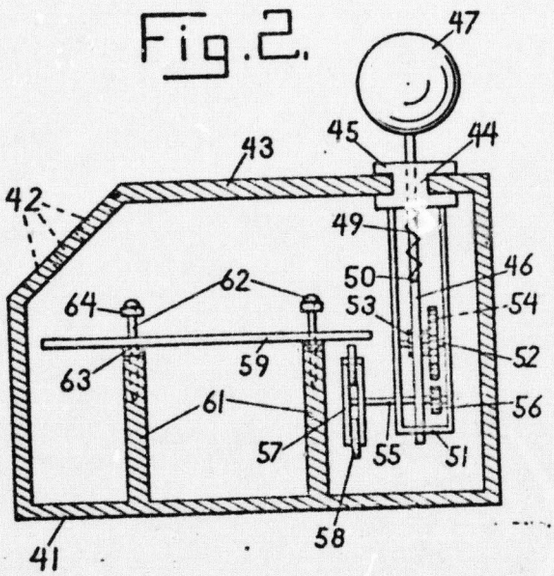
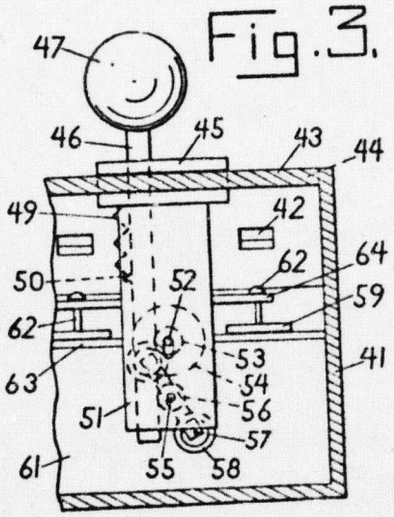


Fig. 3.



Inventor:
HARRY ZIMMERMAN

By Manning & Bloch

Attorney

Patented Feb. 13, 1951 2,541,143

UNITED STATES PATENT OFFICE

2,541,143

TOY MUSICAL INSTRUMENT

Harry Zimmerman, New York, N. Y.

Application September 11, 1948, Serial No. 48,831

9 Claims. (Cl. 84—404)

1

My invention relates to musical toys of that type which produces a melody or a series of different tones by strokes hitting differently tuned bars or sounding elements.

Objects of my invention are to produce tremolant tones or tones comprising a plurality of individual sound impulses following each other quickly, to produce each plurality of impulses or each tremolant tone by one stroke of the player's hand or finger, to create loud, clear and ringing sounds overlapping in one tone, and thereby to provide a novel toy having a particularly pleasant musical effect.

Other objects are to produce this effect with a toy that can be easily played by a child, and to provide the toy with a mechanism which produces the tremolant nature of the tones automatically whenever the player strikes a tone.

Further objects are to achieve these results with simple and inexpensive means, and to provide a novel musical toy that can be manufactured easily and quickly.

Still other objects and advantages will appear from the following description of an exemplifying embodiment of my invention, from the appended claims and from the accompanying drawing in which:

Fig. 1 shows a top view of an illustrative embodiment, a portion of the cover being broken off.

Fig. 2 shows a cross-section taken along the line 2—2 in Fig. 1.

Fig. 3 shows a cross-section of a broken off part of the latter embodiment, said cross-section being taken along the line 3—3 in Fig. 1.

The embodiment shown in Figs. 1 to 3 comprises one striking device shiftable relative to several tone bars whereby the same striking member may hit any one of a row of differently tuned tone bars. This arrangement makes the embodiment similar to a xylophone.

A casing 41 may have openings 42 for the escape of sound waves and has a cover 43 provided with a slot 44. A block 45 of I-shaped cross-section is slidable along the slot 44 and has an opening through which a rod 46 passes. The upper end of the rod 46 is affixed to a handle or knob 47. By horizontal movement of the handle 47, the block 45 can be shifted from one to another of a plurality of positions which are indicated by suitable indicia, for example, by lines 48 extending perpendicularly to the slot 44 on the top surface of the cover 43.

The rod 46 passes vertically slidably through the block 45. By vertical movement of the handle

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47, the rod 46 can be moved down against the pressure of a spring 49 which has a lower end affixed to a projection 50 of the rod 46 and has an upper end affixed to the block 45.

The rod 46 forms a part of a mechanism which transforms the vertical movement of the handle into a rotary movement comprising several turns during one stroke of the handle. The rod 46 has a lower end passing slidably through an opening in the bottom of a U-shaped frame 51 which is affixed to the lower side of the block 45. A shaft 52 carrying a pinion 53 and a toothed wheel 54 is rotatably journalled in the elongated vertically extending slots formed in opposite side portions of the frame 51. A shaft 55 carrying a pinion 56 is disposed below and parallel to the shaft 52 and has the opposite ends thereof journalled in the side portions of the frame 51. A part of the rod 46 which is positioned within the frame 51 is provided with teeth whereby the rod constitutes a rack meshing with the pinion 53. Initial downward movement of the rod 46 effects similar downward movement of the shaft 52 until the latter reaches the bottom of the slots. In this position of the shaft 52, the toothed wheel 54 meshes with the pinion 56 on the shaft 55. Further downward movement of the rod 46 causes rotation of the pinion 53, the wheel 54, and the pinion 56 for rotating the shaft 55.

An arm 57 has a center affixed to the shaft 55 and has ends carrying loosely connected striking members 58. For example, the members 58 may be washer-like rings, and the arm 57 may form an elongated loop passing through the rings 58 with clearance. When the members 58 rotate with the arm 57 and the shaft 55, the centrifugal force moves the members radially to their most outward positions.

The plane in which the members 58 rotate is vertical and preferably parallel to the slot 44. Tone bars 59 are arranged in a row which extends in the direction of the slot 44 and are substantially horizontally positioned at a level so far above the shaft 55 that each tone bar reaches in the upper part of the members' rotary paths when the shaft 55 is positioned vertically under the respective tone bar 59. The shaft 55 can be moved into position under any of the tone bars by shifting the handle 47 and thereby the block 45 together with the entire striking mechanism in the manner described before.

In the mentioned position of rest, the tone bars 59 are supported by walls 61 crossing the interior of the casing 41 in directions parallel to the slot 44. The tone bars are free to move up-

wardly under the impact of the members 58 and are guided in this upward movement by headed nails 62 driven into the top surfaces of the walls 61 and passing through openings in the bars. The tone bars drop to the supported position immediately after the passage of a striking member. The top surfaces of the walls 61 may be covered with cushioning layers 63. Other cushioning layers 64 may extend under the heads of the nails 62. The nails pass through the layers 63 and 64.

The handle 47 serves two purposes. By horizontal movement of the handle, the striking mechanism is brought into proper position relatively to any desired tone bar. By vertical movement downwardly, this tone bar is struck. When the rod 46 is depressed and subsequently released, the spring 49 will urge the rod 46 towards the original elevated position thereof. Upward movement of the rod 46, meshing with the pinion 53 on the shaft 52, will effect upward movement of the latter within the elongated slots and thereby disengage the wheel 54 from the pinion 56 to permit free-wheeling of the shaft 55. Therefore, the rod 46 will only drive the shaft 55 during the downward movement of the former. Hence any desired sequence of tones can be produced by simple movements of one hand.

I desire it understood that my invention is not confined to the particular embodiments shown and described, the same being merely illustrative, and that my invention may be carried out in other ways without departing from the spirit of my invention as it is obvious that the particular embodiments shown and described are only a few of the many that may be employed to attain the objects of my invention.

Having described the nature of my invention, what I claim and desire to protect by Letters Patent is:

1. In a musical toy, a horizontally disposed rotatable shaft, a striking member on said shaft, striking elements carried by the opposite ends of said member and defining a circular closed path when said shaft is rotated, a vertically movable tone bar extending into said circular closed path when in lowermost position for contact with said striking elements and movable upwardly out of said path, and means rotating said shaft in one direction so as to effect striking of said elements against said tone bar from below.

2. In a musical toy, a rotatably mounted striking member having striking elements on the opposite ends describing a closed circular path when said member is rotated, and operating means for rotating said member including a pinion fixedly connected to said member, a rotatable gear means mounted for axial movement relative to the axis of rotation of said pinion, linearly movable means meshing with said gear means and adapted, when moved in one direction, to mesh said gear means with said pinion and to effect the rotation of said gear means, spring means constantly urging said linearly movable means in the direction opposed to said one direction for disengaging said gear means from said pinion, and a tone bar supported in a position where said bar reaches into said closed circular path.

3. In a musical toy, a rotatably mounted striking member having striking elements on the opposite ends describing a closed circular path when said member is rotated, a tone bar supported in a position where said bar reaches into said closed circular path, and operating means for rotating said striking member including a linearly movable member and gear means interposed between said linearly movable member and said striking member, said gear means constantly engaging said linearly movable member and engaging said striking member only when said linearly movable member is moved in a selected direction.

4. In a musical toy, a substantially horizontally disposed tone bar mounted for limited vertical movement, a striking member rotatable about a horizontal axis and having striking elements on the opposite ends thereof describing a closed circular path when said member is rotated, said tone bar in the lowermost position thereof extending into said circular path adjacent the top portion of said path and movable vertically out of said path, and operating means for rotating said striking member in a direction so that said striking elements strike against said tone bar from below, said operating means including a linearly movable member and gear means meshing with said linearly movable member and engaging said striking member only when said linearly movable member is moved in one direction to thereby effect rotation of said striking member in said above mentioned direction.

5. In a musical toy, the combination according to claim 3, wherein said gear means includes a pinion fixed relative to said striking member, a rotatable toothed wheel fixed to a shaft extending parallel to the axis of rotation of said pinion and movable radially thereof in a plane parallel to the line of movement of said linearly movable member, a second pinion fixed to said toothed wheel, a gear rack formed on said linearly movable member meshing with said second pinion, and spring means connected to said linearly movable member constantly urging the latter in a direction away from the axis of rotation of said first pinion, said toothed wheel meshing with said first pinion when said linearly movable member is moved against the force exerted by said spring means thereby rotating said striking member and being disengaged from said first pinion when said linearly movable member is moved in said direction urged by said spring means to thereby permit free wheeling of said striking member.

6. In a musical toy having a housing, a frame extending into said housing and slidably carried by the latter for movement therealong, a horizontally disposed shaft rotatably mounted in said frame, a striking member on said shaft, striking elements carried by the opposite ends of said member and defining a circular closed path when said shaft is rotated, a plurality of vertically movable tone bars in said housing disposed at right angles to the direction of movement of said frame, each of said tone bars extending into said circular closed path when in lowermost position and in registry with said frame and movable upwardly out of said path, and means carried by said frame rotating said shaft in one direction so as to effect striking of said elements against a selected one of said tone bars from below.

7. In a musical toy, a supporting structure, a frame slidable along said structure, a rotatably arranged striking element, operating means carried by said frame for carrying and rotating said element in a closed circular path, a plurality of tone-elements, disposed across the sliding direction of said frame, being supported in positions where each tone-element, when in registry with said frame, reaches into said path whereby the tone-element is struck by said striking element,

and being movable in the direction of said strokes out of said path.

8. In a musical toy, a supporting structure, a frame slidable along said structure, a rotatably arranged striking element, operating means carried by said frame for carrying and rotating said element during each single operation in a closed circular path, a plurality of tone-elements disposed across the sliding direction of said frame, being supported in positions where each tone-element, when in registry with said frame, reaches into said path whereby the tone-element is struck by said striking element, and being movable in the direction of said strokes out of said path.

9. In a musical toy, a supporting structure, a frame slidable along said structure, a member rotatably connected to said frame and having an eccentric end, a striking element loosely connected to said end, operating means carried by said frame for rotating said member with said element in a closed circular path, a plurality of tone-elements, disposed across the sliding direction of said frame, being supported in position

where each tone-element, when in registry with said frame, reaches into the path of said striking element whereby the tone-element is struck by said striking element, and being movable in the direction of said strokes out of said path.

HARRY ZIMMERMAN.

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May 16, 1950 J. SJÖLANDER 2,508,300

MUSICAL INSTRUMENT

Filed April 5, 1948

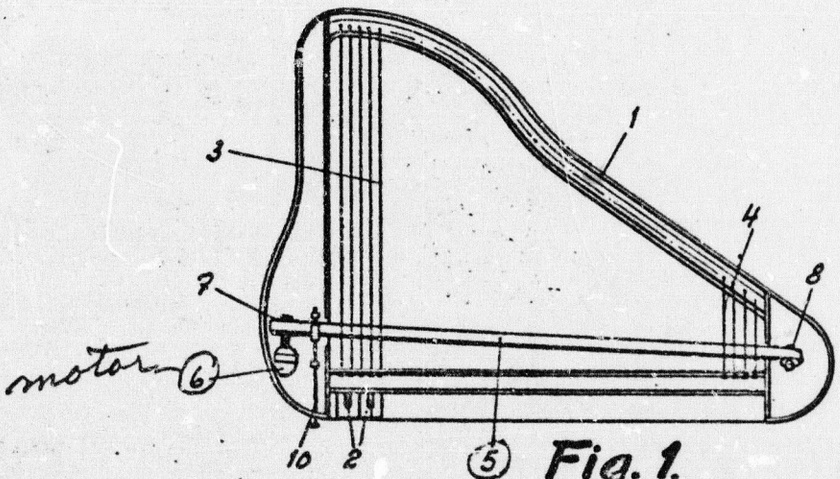


Fig. 1.

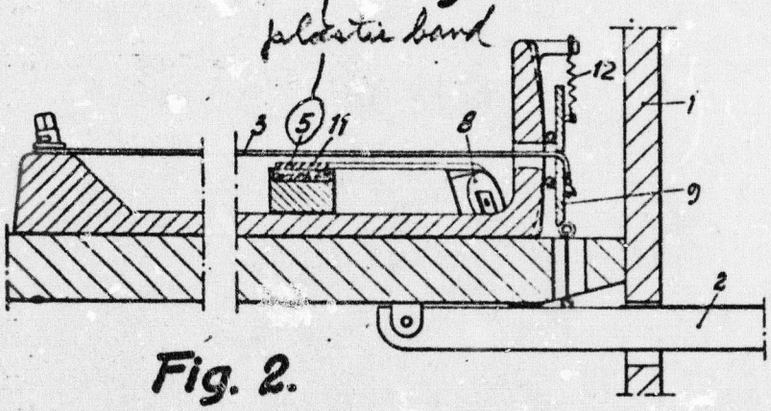
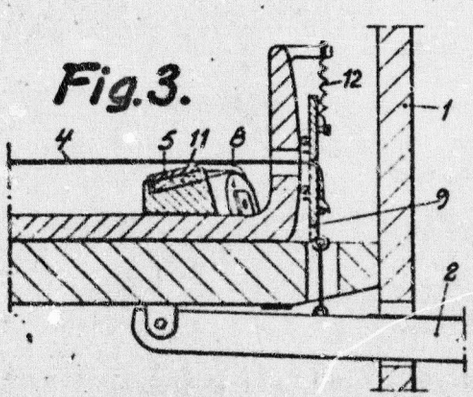


Fig. 2.

Fig. 3.



INVENTOR:
JOSEF SJÖLANDER
BY Leon M. Straus

Patented May 16, 1950 2,508,300

UNITED STATES PATENT OFFICE

2,508,300

MUSICAL INSTRUMENT

Josef Sjölander, Stockholm, Sweden

Application April 5, 1948, Serial No. 18,969
In Sweden April 11, 1947

3 Claims. (Cl. 84—257)

1

The present invention relates to improvements in stringed instruments, particularly pianos, grand pianos and the like, and is substantially characterized by an endless band driven by an electric motor and arranged, in the proximity of the strings of the instrument and approximately at right angles to their longitudinal direction, against which band every string is adapted to be brought, during the running of the band, by means of manually operable keys. The endless band is preferably mounted in a twisted condition, for instance along a felt bedding, in a manner such that the band is enabled for a certain length thereof to actuate some of the strings all over its width, and for another length to actuate other strings only by an edge portion of the band, all of the strings of the instrument being operable, however, by one and the same band. The endless band may consist of plastic material, and one end of each string may be operable by the depression of an ordinary key and by means of a spring, which is retracted to an initial position, when the key is no longer depressed. The speed of the driving motor for the endless band is controllable by means of a brake member or a pedal or the like actuating the control of the motor current.

The accompanying drawing illustrates a form of embodiment of the invention.

Fig. 1 is a top plan view of a grand piano, the lid of which is removed, and which has incorporated therein an embodiment of the invention. Fig. 2 is a vertical section to a larger scale of a detail of the grand piano with a string and a key, and Fig. 3 represents a vertical section of a grand piano with the key thereof in depressed position.

In the various figures, 1 designates a grand piano, 2 the key, 3 and 4 strings in the bass octaves and the treble respectively, and 5 denotes an endless plastic band disposed at right angles to the longitudinal direction of the strings and adapted to be driven by an electric motor 6, said band running over two guide wheels 7 and 8, the axes of which are not parallel but disposed obliquely relatively to each other in such manner that the band is twisted to a certain extent, so that in the example of embodiment shown the band 5 runs parallel to and somewhat underneath the strings in the bass octaves (Fig. 1) over its entire width, when the strings are not actuated, whereas in the treble (Fig. 2) the band approaches the strings with an edge portion of the band. The band 5 preferably rests on a stationary felt bedding 11. Each key 2 is coupled to a

2

slide 9, which is adapted to be displaced upwardly into an initial position by means of a drawspring 12 and to be depressed by the key, said slide having the one end of a string 3 (4) secured thereto. Through the depression of the key 2 a string is brought into contact with the endless band 5, which in operation serves as a bow on the string, a peculiar tone being thus produced. Said tone can be said to be an intermediate between a violin tone and an ordinary piano tone. The speed of the band 5 is controllable by means of a braking member 10. By means of arrangements (not shown) a resinous substance or the like may be applied to the band 5. In place of the braking member 10, a pedal contrivance may be made use of, and if desired the motor current may of course be varied by means of an adjustable resistance. The arrangement according to the invention may be disconnectible, so that a piano or the like can be used in the ordinary manner.

Obviously, the details above described may also be constructed in other ways, without departing from the principle of the invention.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

1. In an instrument equipped with strings; a power driven endless bow-band arranged in the proximity of said strings and at right angles to the longitudinal direction of the latter, means for reciprocably moving each of said strings to and from said band, a pair of rollers arranged below said strings and rotatable about axes extending obliquely with respect to each other, whereby said endless band is guided over said rollers in twisted position, and stationary pad means for supporting said band between said rollers, a predetermined length of said twisted band being adapted to actuate some of said strings, another length of said twisted band being arranged to present an edge portion thereof for coaction with other of said strings.

2. In an instrument according to claim 1, wherein said means for reciprocably moving each of said strings include a respective key and a slide member connected therewith, and means resiliently supporting one end of each string by the respective slide member.

3. In an instrument equipped with strings; a power driven endless bow-band arranged in the proximity of said strings and at right angles to the longitudinal direction of the latter, means for reciprocably moving each of said strings to

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and from said band, means for guiding said endless band below said strings partly in parallel and partly in overedge position to said strings, whereby some of said strings may be brought in contact with the parallel portion of said endless band, whereas other strings are adapted for contact with the edge portion of said band.

JOSEF SJÖLANDER.

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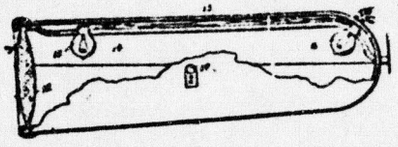
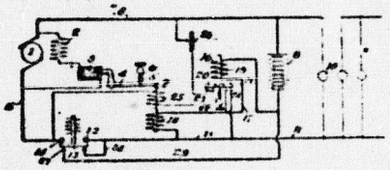
Number	Name	Dat
653,135	Clark	July 3,
1,619,722	Grinoch et al.	Mar. 1,

a light device in said casing adjacent to the reflector and adjacent to the lens, a second lamp in said casing adjacent



to the reflector and adjacent to the other end of the casing, and means for pivotally supporting said casing.

1,293,720. ELECTRIC REGULATION. JOHN L. CREVELING, New York, N. Y., assignor to Safety Car Heating and Lighting Company, a Corporation of New Jersey. Filed Feb. 16, 1912, Serial No. 678,073. Renewed July 6, 1918. Serial No. 243,706. 14 Claims. (Cl. 171—313.)



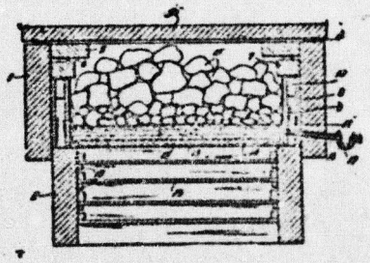
1. The combination with a storage battery and a generator, of means for regulating the generator, operating means for controlling said regulating means responsive to voltage fluctuations, operating means for controlling said regulating means responsive to current fluctuations and means responsive to the current through the battery for rendering one of said operating means operative and the other inoperative.

3. The combination with a storage battery and a generator, of means for regulating the generator, operating means for the regulating means responsive to voltage fluctuations, operating means for the regulating means responsive to current fluctuations and means whereby the current supplied by the generator to the battery determines which of said operating means shall regulate the generator.

7. The combination with a storage battery and a generator, of means for regulating the generator, controlling means therefor comprising a coil responsive to voltage fluctuations and a coil responsive to current fluctuations and automatic means responsive to current fluctuations through the battery for controlling the operation of said coils.

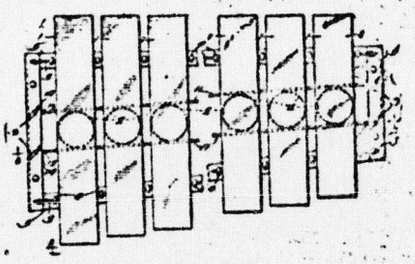
11. The combination with a storage battery and a generator, of a regulator for the generator comprising operating means comprehending a coil in shunt to said generator, a coil in series with said generator and battery and means for controlling the operativeness of said coils responsive to battery current fluctuations.

1,293,721. DRY-COOLING APPARATUS. ROBERT E. DAVIS, Oak Park, Ill. Filed May 3, 1917. Serial No. 166,180. 2 Claims. (Cl. 62—46.)



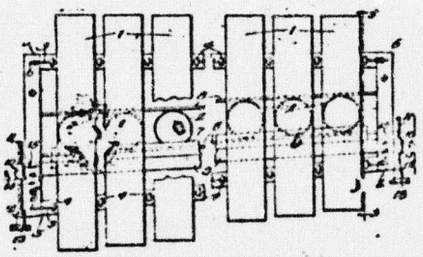
1. In dry cooling apparatus, a case comprising an upper and a lower compartment, the sides of the upper compartment overlapping those of the lower compartment, an air tight cover removably carried by said upper compartment, a walled air compartment formed in said upper compartment, a pan carried by said upper compartment with its rim resting upon the said air compartment and its bottom separating said upper and lower compartments, said pan serving as a container for a refrigerant material, a drain for said pan, and trays removably carried by said lower compartment.

1,293,722. XYLOPHONE. JEFFERSON CLAUDE DEAGAN, Chicago, Ill. Filed Oct. 24, 1917. Serial No. 198,271. 1 Claim. (Cl. 84—31.)



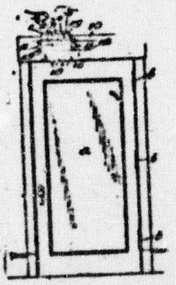
A xylophone including a group of sound producing bars; a group of resonator elements for said bars; and mechanism for adjusting one of said groups toward and from the other transversely of the bars.

1,293,723. XYLOPHONE. JEFFERSON CLAUDE DEAGAN, Chicago, Ill. Filed Oct. 24, 1917. Serial No. 198,272. 1 Claim. (Cl. 84—31.)



A xylophone having a resonator for each of a plurality of bars of the xylophone; a shutter interposed between each of said bars and the resonator pertaining thereto, said shutters being mounted to swing across the resonators; and mechanism for simultaneously swinging said shutters.

1,293,724. PERCUSSION MUSICAL INSTRUMENT. JEFFERSON CLAUDE DEAGAN, Chicago, Ill. Filed Oct. 24, 1917. Serial No. 198,273. 5 Claims. (Cl. 116—1.)



1. A musical instrument having a plurality of sound producing bars, and hammers, one for each of the bars, mounted for free swinging movement, in combination with

Nov 1, 1949. O. J. ALVAREZ 2,486,545

ELECTRICAL PIANO

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Fig. 1.

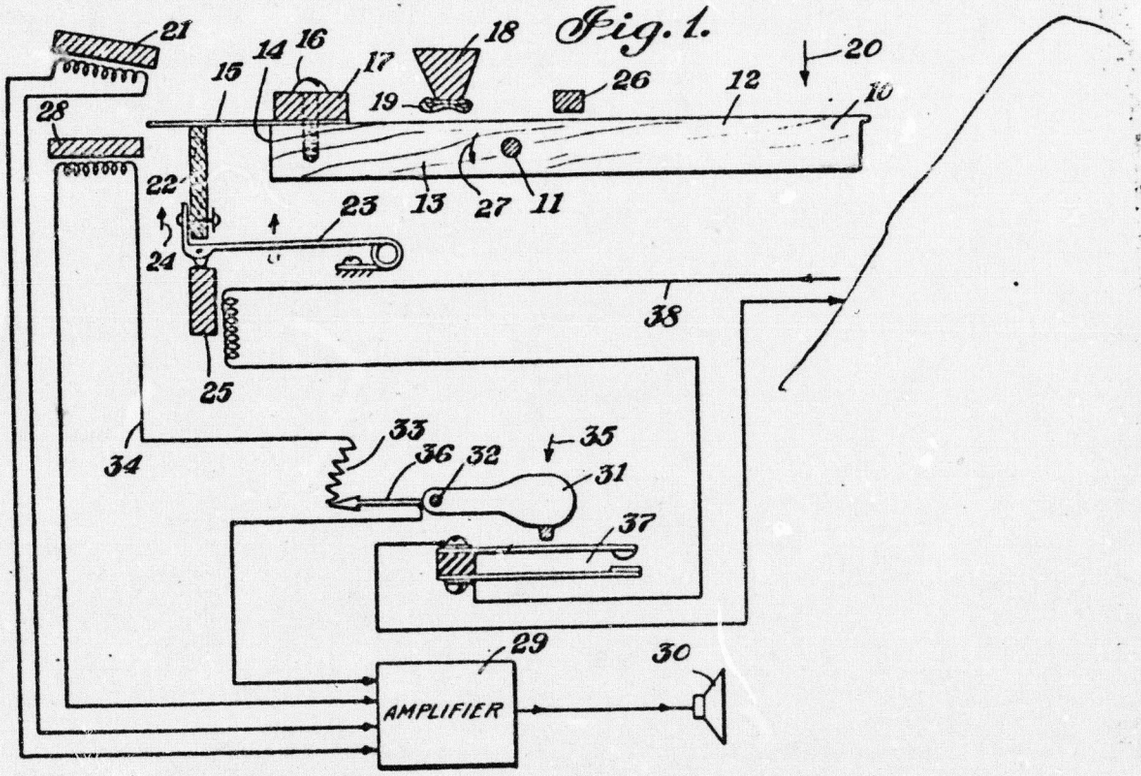

Fig. 2.

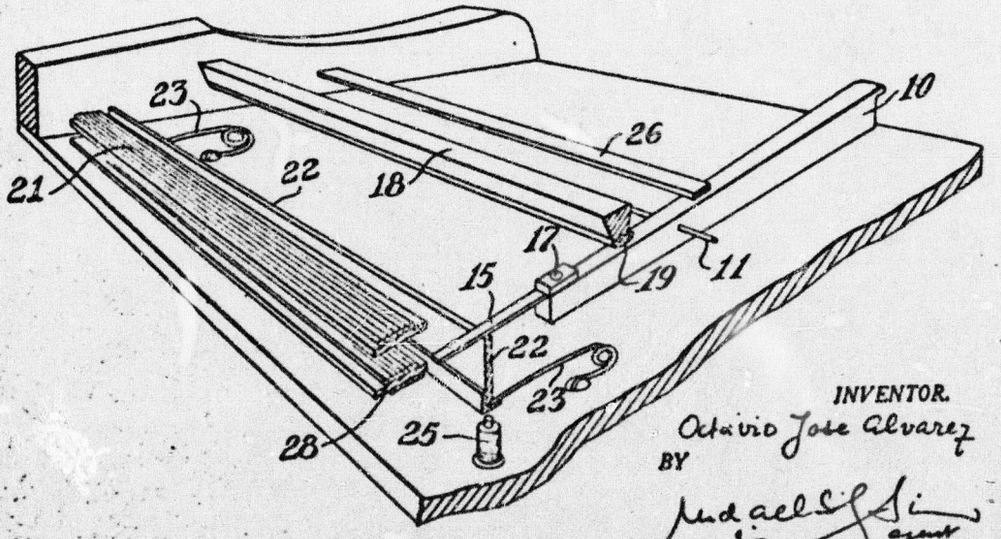

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Fig. 3.

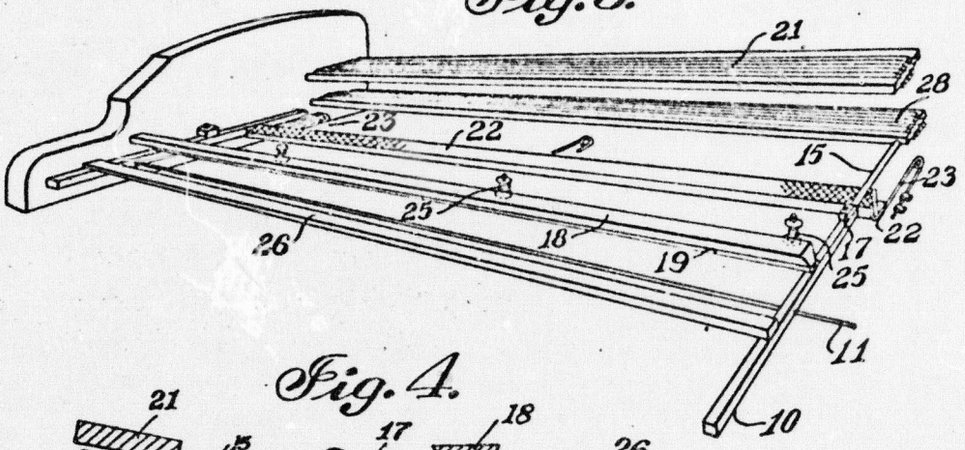

Fig. 4.

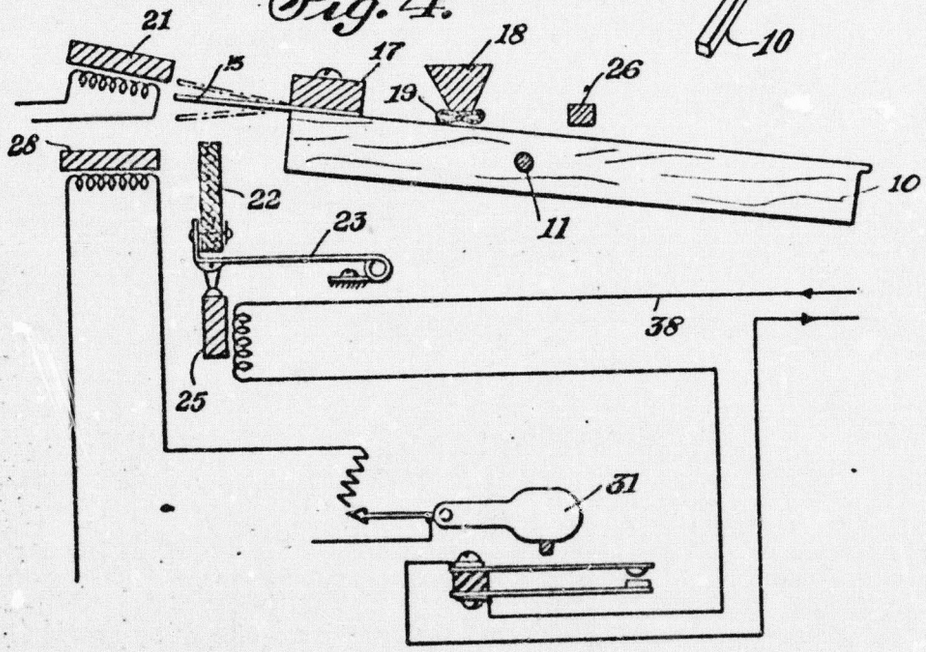

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Fig. 5.

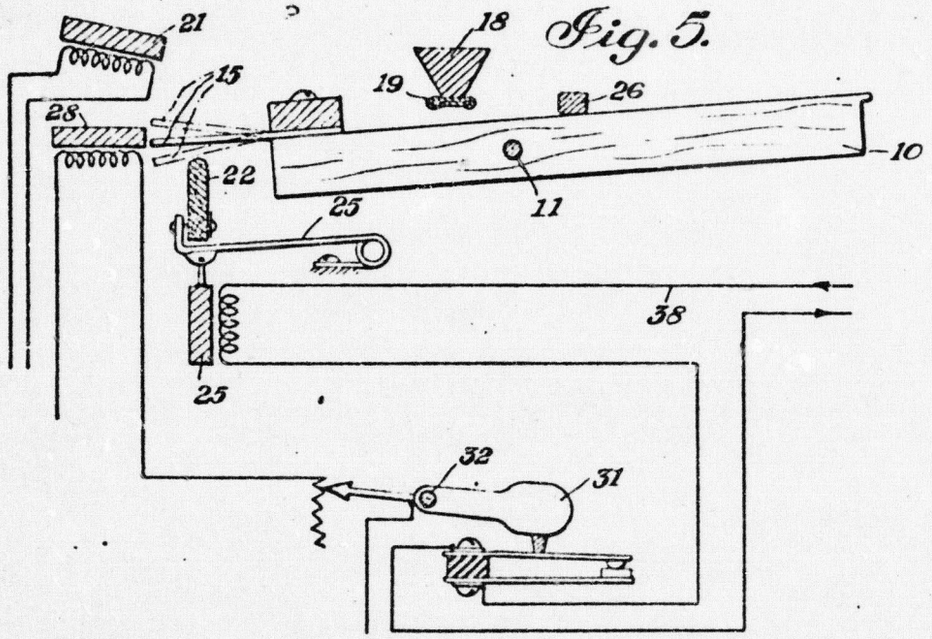

Fig. 6.

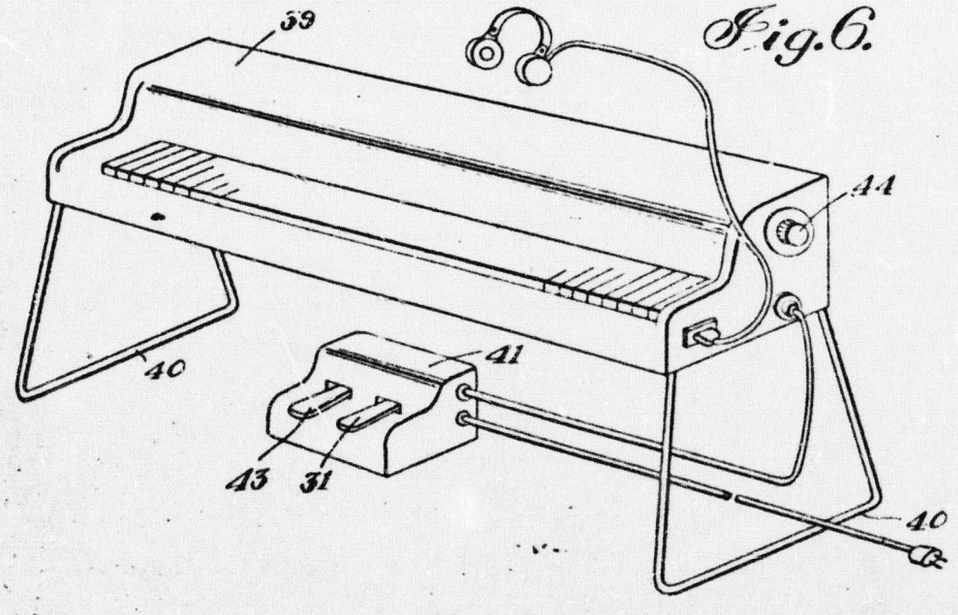

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Fig. 7.

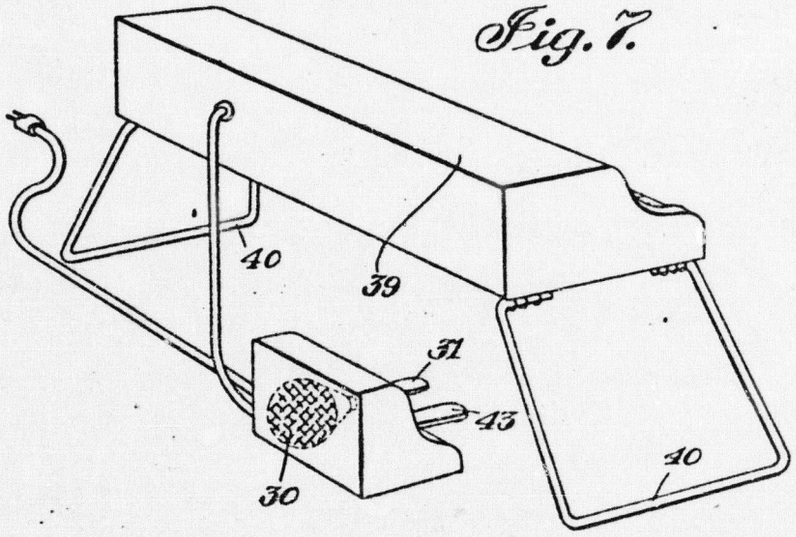
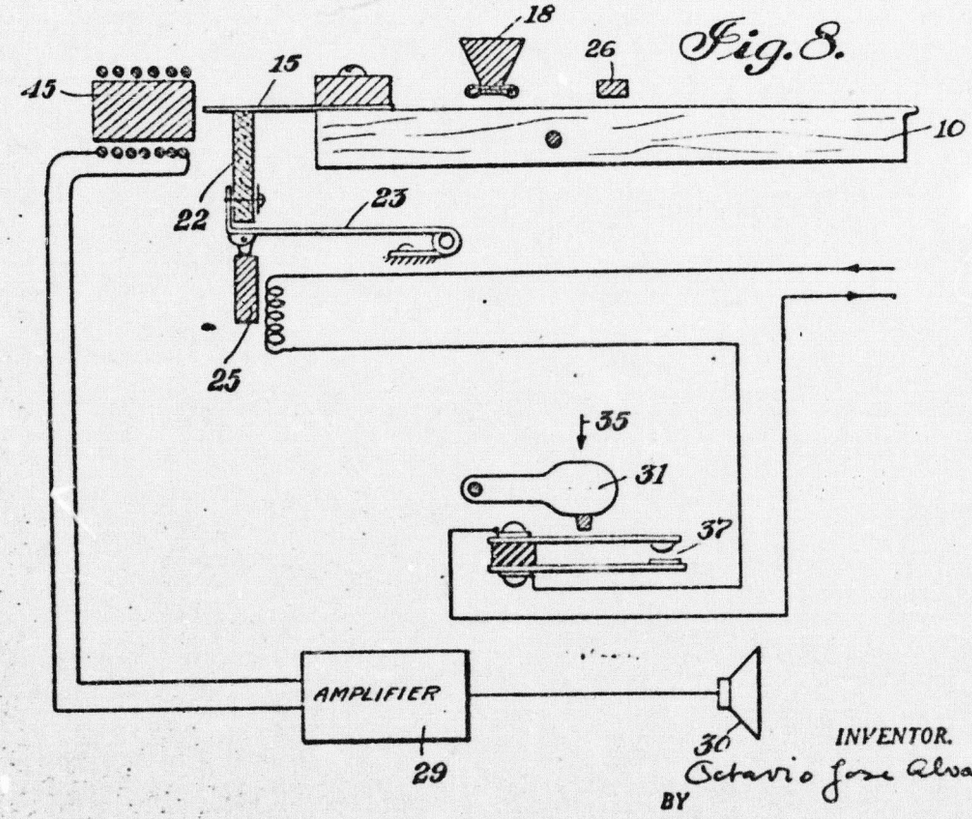


Fig. 8.



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Patented Nov. 1, 1949 2,486,545

UNITED STATES PATENT OFFICE

2,486,545

ELECTRICAL PIANO

Octavio Jose Alvarez, New York, N. Y.

Application May 22, 1946, Serial No. 671,587

21 Claims. (Cl. 84—1.15)

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My present invention relates to musical instruments and more particularly to electrical instruments of the piano type.

It is an object of my present invention to provide an electrical musical instrument which is extremely simple in construction and nevertheless, has a touch which is very similar to the one of a piano of usual type. Also the music obtained from an electrical musical instrument of this type is very similar in tonal quality to the music obtainable with a conventional mechanical piano.

It is a further object of my present invention to provide a musical instrument of the above type which is equipped with a conventional keyboard and pedals adapted to be operated like those of a conventional piano.

With the above objects in view, my present invention mainly consists of an electrical musical like instrument comprising in combination a series of vibration creating units each of which consists of a magnetized steel reed, a turnable holding member to which this magnetized steel reed is secured so as to be adapted to vibrate relative to this holding member, and a stop member arranged so as to be adapted to stop turning of the holding member after the same has been turned by said operating member.

An electrical musical instrument of the type proposed above comprises in addition to the described vibration creating units an electric vibration pick-up arrangement arranged so that the reeds secured to the holding members are turnable between two positions in one of which they are near to the pick-up arrangement and in the other of which they are farther therefrom.

In an instrument of the type described the various tones are preferably obtained by making the reeds of different lengths. When an operating member is moved the corresponding holding member will turn until it abuts against the stop member; thus, this stop member will abruptly terminate turning movement of the holding member thereby causing vibration of the reed secured to the same. Such vibration of the reed will be picked up by the electrical vibration pick-up arrangement and transformed in well-known way into sound vibrations which are transmitted then by a loud speaker of conventional type.

In accordance with a preferred embodiment of my present invention, an electrical piano embodying the above described elements and features comprises a common electric vibration pick-up arrangement and a series of vibration creating units; each of these vibration creating units comprises a piano key consisting of an outer operating key portion and an inner supporting key portion, a vibratable magnetized steel reed secured to this inner supporting key portion at the inner end thereof in such a manner as to enable vibration of the reed relative to the key, common

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pivoting means turnably supporting all piano keys so that each of them is turnable between inoperative position in which the reed secured to the key is relatively far from the common pick-up arrangement and operative position in which the reed is relatively near to the common pick-up arrangement within the pick-up sphere of the same, and a common slightly resilient stop member arranged in the path of turning of all piano keys so as to abruptly stop turning of a key when the same is turned by its outer operating portion from inoperative into operative position; and abrupt stopping of the key in turn will result in vibration of the reed secured thereto.

Of course, a piano of the type proposed by me might also be provided with a so-called loud pedal and a so-called soft pedal which are simply combined with the electrical amplifier and loud speaker actuated by the electric vibration pick-up arrangement mentioned above. Of course, it is also possible to obtain with one single pedal both effects.

In addition to these pedals, it is of course, also necessary to have a sustaining pedal by which it is possible to sustain or draw out the tones created by depressing the keys.

In order to obtain this sustaining effect I provide in accordance with a preferred embodiment of my present invention a second electric vibration pick-up arrangement arranged spaced from the first electric vibration pick-up arrangement described above; the keys and their pivoting means are then arranged so that each of the keys is turnable between a first position in which the reed secured to the key is located near the first pick-up arrangement and a second position in which it is located near the second pick-up arrangement.

If a second pick-up arrangement is provided as described in the preceding paragraph, the slightly resilient stop member, preferably called first stop member, is arranged so as to stop movement of a key when depressed in the above mentioned first position, namely in a position in which the reed secured to the key is located near the first pick-up arrangement. Furthermore, I provide also a second stop member which is arranged movably into the path of the reeds themselves so as to stop vibration of the same after the keys have been depressed and released thereafter. Finally, I provide also a third stop member arranged in the path of the keys so as to stop the same when the reeds secured thereto are located near the second pick-up arrangement mentioned above.

The pedal which creates a sustaining tone effect is electrically connected with the second stop member and adapted to move the same out of the path of the keys and the reeds secured thereto when a sustained tone effect is desired.

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By such action of the pedal the key or keys are free to move when released until the reed or reeds secured to them are located opposite the above mentioned second pick-up arrangement which will transform the continuing vibrations of the reeds into sustained tone effects reproduced by the loud speaker arrangement mentioned above.

The novel features which I consider as characteristic for my invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a schematic diagrammatic side view, partly in sections, of an electrical piano of the type proposed by me;

Fig. 2 is a perspective rear view of the piano schematically and diagrammatically shown in Fig. 1, partly in sections;

Fig. 3 is a perspective front view of the piano shown in Figs. 1 and 2, partly in sections;

Fig. 4 is a schematic diagrammatic side view of my new piano similar to the view shown in Fig. 1, showing a key in depressed position;

Fig. 5 is a view similar to the one in Figs. 1 and 4, showing the sustaining pedal in depressed operative position;

Fig. 6 is a perspective outer front view of an electrical piano of the type shown in Figs. 1 to 3;

Fig. 7 is a perspective outer rear view of the same piano; and

Fig. 8 is a diagrammatic, schematic side view, partly in section, of a modified embodiment of a piano of the type proposed by me.

As shown in Figs. 1 to 3, my new piano comprises a series of piano keys 10 all of which are pivoted on a common pivoting rod 11. Each of the keys 10 consists of an outer operating key portion 12 and an inner supporting key portion 13.

In accordance with my present invention I secure to the inner end 14 of each of the keys 10 a reed 15 which is freely vibratable and consists of a steel band or like member as clearly shown in Figs. 2 and 3.

I wish to mention that for purposes of clarity I have shown in Figs. 2 and 3 only one single key; of course, there are in a piano the usual number of keys; however, I have omitted them in order to facilitate showing of the construction details of a key. All keys are equal in construction; the only difference is that the reeds are differently shaped, e. g. of different lengths so as to create different vibrations and thus cause different tones.

Reed 15 mentioned above is secured to the inner end 14 of the supporting portion 13 by means of screw 16 and the magnetized steel block 17.

I arrange in the path of the key itself three stop members: A first stop member consisting of a rod 18 to which the slightly resilient tubular member 19 made of a plastic material and having a substantially elliptical cross section is secured. This first stop member which, as shown in Figs. 2 and 3 cooperates with all the keys is arranged so that when one of the keys 10 is depressed at its operating portion 12 in direction of arrow 20 the key moves into the position shown in Fig. 4 abutting against the plastic tubular member 19 at the moment when reed 15 is located at least substantially opposite and near the common electrical vibration first pick-up arrangement, i. e. first pick-up coil 21.

In addition to this first stop member I pro-
vide a second movable stop member which co-
sists of a band-shaped piece 22 of felt or
resilient material, arranged as shown in
drawings. This second stop member is mov
supported by the spring supports 23 tending
move it from its position shown in Fig. 5, in di
tion of arrow 24 into its position shown in Fi
The spring supports 23 are combined with s
noid arrangements 25 of well-known type ada
when energized to move the second stop mem
22 against action of spring support 23 from
position shown in Fig. 1 into the position sh
in Fig. 5.

Finally, I arrange in the path of the keys
a common third stop member which consist
a bar 26 arranged in such a manner as to
turning movement of the keys in direction o
row 27 when the second stop member 22 is
a retracted position shown in Fig. 5. It shou
stressed that this stop member 26 has to be
cated so that in the position shown in Fig. 5
non-depressed keys 10 are located near the
ond electric vibration pick-up arrangement, i
near the pedal pick-up coil 28.

Although evident, it should be noted that
keys 10 are supported by the pivoting bar 11
such a manner that each of them has a tend
to turn in direction of arrow 27, i. e. to ret
automatically from the depressed position sh
in Fig. 4 into one of the positions shown in F
1 and 5.

Both the main pick-up coils 21 as well as t
pedal pick-up coil 28 are connected in well-kno
manner with the amplifier 29 and loud speaker
In order to properly operate the pedal pick-
coil 28 and to synchronize it with the movem
of the second stop member 22 described ab
the pedal 31 is turnably supported by pivot
and electrically connected on the one hand w
pick-up coil 28 and on the other hand with
solenoids 25 serving for retracting the stop m
ber 22.

The electrical connection between pedal 31
the pick-up coil 28 consists of the combined
sistor switch arrangement 33 included in c
ductor 34 connecting the pick-up coil 28 w
amplifier 29. This combined resistor switch
rangement 33 is constructed so that in the
operative position of the pedal 31 shown in F
the connection between the pick-up coil 28
the amplifier 29 is interrupted.

If the pedal is pressed down in direction
arrow 35, e. g. into the position shown in F
the turnable switch arm 36 forming part of
switch resistor 33 will contact the resistor
ment and establish contact between the pick
coil 28 and amplifier 29.

The resistor effect of resistor 33 upon the
trical vibrations transmitted from pick-up co
to amplifier 29 will depend upon the degre
which the pedal is pressed down: If the ped
is pressed down slightly all windings of the
tor 33 will be included in conductor 34 wh
pedal 31 is entirely pressed down actually n
sistor winding will be interposed between pic
coil 28 and amplifier 29.

Pressing down of pedal 31 results also in cl
of switch 37 included in circuit 38 of the
noids 25. Thus, by pressing down of the
31 the solenoids 25 will be energized whic
sults in a downward movement of the so
cores together with the stop member 22 to w
they are secured from the position shown in
Fig. 1, into the position shown in Fig. 5.

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My new piano described above in detail operates as follows:

In inoperative position the pedal 31 and keys 10 are in the position shown in Fig. 1, i. e. the reeds 15 are supported by stop member 22 and the resistor 33 and switch 37 operated by pedal 31 are open.

In order to create a tone, one of the keys, e. g. key 10 shown in Fig. 7 is depressed in direction of arrow 20. This results in upward turning movement of the inner supporting key portion 13 until the same abuts against the resilient tubular stop member 19. This creates a certain impact resulting in vibration of the abruptly stopped reed 15.

At this moment the key 10 and the reed 15 are in the position shown in Fig. 4, i. e. reed 15 is located near the main pick-up coil 21. In this position the vibration of the reed 15 will be picked up by the coil 21, transformed into electrical vibrations which, after amplification by means of amplifier 29 are transformed into audible sound waves by means of the loud speaker 30.

As stated above, the reeds 15 are differently shaped so that vibration of each reed will create a different audible tone. In this connection it should be stressed that if several keys are depressed simultaneously the created vibrations will not interfere with each other; to the contrary, each of the vibrations will be transformed into corresponding electrical vibrations, amplified separately and reproduced by the load speaker independently from other vibrations. Thus, a musical accord created by depressing several keys will sound on an electrical piano of the above type the same as on a conventional hammer type piano.

If the pedal 31 is in the position shown in Fig. 1 and key 10 is released from its position shown in Fig. 4 after having been depressed and having created a tone as described above, it will automatically return into its position shown in Fig. 1. During such movement reed 15 will abut against the stop member 22 which will block further vibration of the reed. Thus, release of the key 10 will result in turning of the same into the position shown in Fig. 1 and termination of vibration of the reed 15, which in turn will abruptly terminate the tone reproduced by loud speaker 30.

In order to sustain the tone after release of one or more keys it is necessary to depress pedal 31 in direction of arrow 35 into the position shown in Fig. 5. In this position switch 37 is closed and the solenoids 25 are energized, moving the stop member 22 out of the path of the reed 15. Simultaneously, depression of pedal 31 results in closing of the resistor switch 33 and operative connection between the pedal pick-up coil 28 and amplifier 29.

Thus, if key 10 is released after pedal 31 has been depressed it will turn due to its own weight into the position shown in Fig. 5, i. e. into a position in which the operating portion 12 of key 10 abuts against the third stop member, i. e. against the stop bar 26. In this position, the reed 15 will be opposite the pedal pick-up coil 28 and the undampened vibrations of the reed will influence this coil and create in the same electrical vibrations which then are transformed in well-known way by means of amplifier 29 and loud speaker 30 into audible tones.

I wish to stress the important fact that stopping of the turning movement of key 10 in direction of arrow 27 by means of the stop rod 26 does not result in termination or dampening of the vibrations of reed 15 after such vibrations have been created by abutment of key 10 against the tubular stop member 19. Vibrations of the reeds 15 can be stopped only by the stop member 22 if the same contacts the reeds 15 directly as shown in Fig. 1.

In order to terminate the sustaining effect of pedal 31 it is only necessary to release the same, i. e. to permit the pedal 31 to turn from its position shown in Fig. 5 into the position shown in Fig. 1. Such turning movement of the pedal is caused by spring means of usual type not shown in the drawings.

Return of the pedal 31 into the position shown in Fig. 1 will result in opening of the resistor switch 33 and of the switch 37. This in turn will disconnect the pedal pick-up coil from amplifier 29 and simultaneously interrupt the circuit 38 energizing the solenoids 25. Thereby the stop member 22 will be released and moved by means of the springs 23 in direction of arrow 24 until it contacts reed 15 stopping vibration of the same as shown in Fig. 1.

In Figs. 6 and 7, I have shown the general arrangement of a preferred embodiment of a piano of the above described type. In this embodiment all keys, reeds, the various stop members and both pick-up coils are arranged in the piano case 39 which, due to the fact that it is not needed as a vibratable resonance element can be made relatively small and light. The supporting legs 40 are turnably attached to the piano case 39 so that they might be folded under the same.

The pedal casing 41 contains the pedals and the various switch means described above together with the loud speaker 30 as shown in Fig. 7. The amplifier 29 might be arranged either in the piano case 39 or the pedal casing 41. As clearly shown in Figs. 6 and 7, I preferably construct the pedal casing 41 so that it has the same cross section as the piano case 39; this facilitates transportation and storage of the same.

Furthermore, I might combine with the piano a set of earphones 42 and a switch for disconnecting the loud speaker 30 so as to enable hearing of the music produced only by means of the earphones whenever desired.

I have shown in Figs. 6 and 7, two pedals: One of these pedals, namely sustaining pedal 31 operates as described above. The other pedal 43 serves as combined loud and soft pedal and is connected with a resistor not shown in the drawings for regulating the volume of the reproduced music. In addition to pedal 43 I might provide another hand operated volume control knob 44 as shown in Fig. 6.

In Fig. 8 I have shown a modified embodiment of my piano in which one common electrical pick-up arrangement, e. g. one single pick-up coil 45 is provided for transforming the mechanical vibrations of reed 15 into electrical vibrations irrespective of the position of the key 10 and reed 15 supported by the same. This means that the pick-up arrangement 45 has to be constructed so as to be adapted to pick up the vibrations of reed 15 when the same is in its so-called second position shown in Fig. 5. I wish to stress that it is of advantage if this pick-up arrangement is also adapted to pick up the vibrations of reed 15 while it is moving between these two positions.

The pick-up arrangement 45 is connected with amplifier 29 and loud speaker 30 in the same manner as the pick-up arrangement 28 shown in Figs. 1 to 5 and described above in detail.

In the modified embodiment of my piano shown

in Fig. 8, I do not provide any switch resistor 33 operated by the pedal 31. In this event pedal 31 operates only and exclusively switch 37 serving for retracting stop member 22 in the same manner as described above in connection with my piano shown in Figs. 1 to 5.

In a modified piano of this type there is no separate pedal pick-up coil but the sustaining effect is obtained only by pressing down the pedal 31 in direction of arrow 35 and thereby retracting the stop member 22 which otherwise would block vibration of reed 15 after release of key 10.

I wish to stress that although I mentioned above use of a "pick-up coil" or "pick-up coils" as electrical vibration pick-up arrangements, my present invention is in no way limited to the provision of such coil or coils. Such coils were mentioned only as examples for pick-up arrangements and my new piano may be provided with "electrical vibration pick-up arrangements" of whatever type if the same are adapted to pick up vibrations of the reeds and to transform them into electrical vibrations as necessary for the purposes of my present invention.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of electrical musical instruments differing from the types described above.

While I have illustrated and described the invention as embodied in electrical pianos, I do not intend to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of my invention.

Without further analysis, the foregoing will so fully reveal the gist of my invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What I claim as new and desire to secure by Letters Patent is:

1. In an electrical piano a series of vibration creating units, each of said vibration creating units comprising a vibratable steel reed; a turnable double armed lever having two lever arms, one of said lever arms serving as holding arm and supporting said vibratable steel reed secured thereto and permitting free vibration of said vibratable steel reed relative to said holding arm and the other of said lever arms serving as operating arm and being turnable so as to turn said holding arm together with said vibratable steel reed secured thereto; and blocking means arranged in the path of turning of said turnable double armed lever for stopping turning of the same.

2. In an electrical piano a series of vibration creating units, each of said units comprising a piano key; pivoting means turnably supporting said piano key so that the same consists of an outer operating key portion and an inner supporting key portion and both said key portions are turnable about said pivoting means; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; and a stop member arranged in the path of turning of said piano key.

3. In an electrical piano equipped with an electric vibration pick-up arrangement, a series of vibration creating units each of said vibration creating units comprising a vibratable steel reed; a movable holding member to which said reed is secured vibratably relative to said holding member; an operating member for moving said holding member between inoperative position in which said vibratable steel reed secured to said holding member is outside of the pick-up sphere of said electrical vibration pick-up arrangement and operative position in which said vibratable steel reed is within said pick-up sphere of said electrical vibration pick-up arrangement; and a stop member for engaging said holding member and stopping movement of the same when it is in said operative position holding said vibratable steel reed within said pick-up sphere of said electrical vibration pick-up arrangement.

4. In an electrical piano equipped with an electric vibration pick-up arrangement, and a series of vibration creating units, each of said vibration creating units comprising a vibratable steel reed; a turnable double armed lever having two lever arms, one of said lever arms serving as holding arm and supporting said vibratable steel reed secured thereto so as to permit free vibration of said vibratable steel reed relative to said holding arm and the other of said lever arms serving as operating arm and being turnable so as to turn said holding arm together with said vibratable steel reed between inoperative position in which said vibratable steel reed secured to said holding arm is outside of the pick-up sphere of said electrical vibration pick-up arrangement and operative position in which said vibratable steel reed is within said pick-up sphere of said electrical vibration pick-up arrangement and a stop member arranged in the path of turning of said turnable double armed lever so as to abruptly stop turning of said turnable double armed lever and cause thereby vibration of said vibratable steel reed secured to said holding arm of said turnable double armed lever when said holding arm is turned by said operating arm into said operative position.

5. In an electrical piano equipped with an electric vibration pick-up arrangement, and a series of vibration creating units, each of said vibration creating units comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof so as to permit vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means supporting said piano key turnably between inoperative position in which said vibratable steel reed secured to said inner supporting piano key portion is outside of the pick-up sphere of said electric vibration pick-up arrangement and operative position in which said vibratable steel reed is within said pick-up sphere of said electric vibration pick-up arrangement; and a slightly resilient stop member arranged in the path of turning of said piano key for abruptly stopping turning of the same and cause thereby vibration of said vibratable steel reed secured to said inner supporting key portion of said piano key when said piano key is turned by said outer operating piano key portion forming part thereof from said inoperative position into said operative position.

6. In an electrical piano a first electric vibration pick-up arrangement, a second ele

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vibration pick-up arrangement located spaced from said first electric vibration pick-up arrangement, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key so that the same is turnable by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member arranged in the path of turning of said piano key for engaging said piano key and abruptly stopping turning of the same causing thereby vibration of said vibratable steel reed secured to said inner supporting key portion of said piano key when said piano key is turned by said outer operating key portion forming part thereof from said second position into said first position; and a second stop member arranged movably between stopping position located in the path of turning of said vibratable steel reed and non-stopping position located outside of said path of turning of said vibratable steel reed.

7. In an electrical piano a first electric vibration pick-up arrangement, a second electric vibration pick-up arrangement located spaced from said first electric vibration pick-up arrangement, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means supporting said piano key turnably by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member located in the path of turning of said piano key for engaging the same when it is in said first position with said vibratable steel reed located relatively near to said first electrical vibration pick-up arrangement; a second stop member arranged turnably between stopping position located in the path of turning of said vibratable steel reed between said first and said second position and non-stopping position located outside of said path of turning of said vibratable steel reed; electro-magnetic moving means for moving said second stop member from its said stopping position into its said non-stopping position; operating means for operating said electro-magnetic moving means; and a third stop member located in the path of turning of said piano key for engaging the same when it is in said second position with said vibratable steel reed located near said second electrical vibration pick-up arrangement.

8. In an electrical piano a first electric vibration pick-up arrangement, a second electric vibration pick-up arrangement located spaced from said first electric vibration pick-up arrangement, electrical sound reproducing means electrically connected at least with said second electrical vibration pick-up arrangement, switch means arranged in the connection between said second electrical vibration pick-up arrangement and said electrical sound reproducing means, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key so that the same is turnable by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member arranged in the path of turning of said piano key engaging the same when it is in said first position located relatively near to said first electrical vibration pick-up arrangement; a second stop member arranged movably between stopping position located in the path of turning of said vibratable steel reed between said first and said second position and non-stopping position located outside of said path of turning of said vibratable steel reed; a third stop member arranged in the path of turning of said piano key for engaging the same when it is in said second position located relatively near to said second electrical vibration pick-up arrangement; and operating means for turning said second stop member from its said stopping position into its said non-stopping position and for simultaneously closing said switch means thus establishing sound reproducing connection between said second electrical vibration pick-up arrangement and said electrical sound reproducing means.

9. In an electrical piano a first electric vibration pick-up arrangement, a second electric vibration pick-up arrangement located spaced from said first electric vibration pick-up arrangement, electrical sound reproducing means electrically connected at least with said second electrical vibration pick-up arrangement, switch means arranged in the connection between said second electrical vibration pick-up arrangement and said electrical sound reproducing means, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key so that the same is turnable by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member located in the path of turn-

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ing of said piano key for engaging the same when it is in said first position with said vibratable steel reed located relatively near to said first electrical vibration pick-up arrangement; a second stop member arranged turnably between stopping position located in the path of turning of said vibratable steel reed between said first and said second position and non-stopping position located outside of said path of turning of said vibratable steel reed; electro-magnetic moving means for moving said second stop member from its said stopping position into its said non-stopping position; operating means for operating said electro-magnetic means so as to move said second stop member from its said stopping position into its said non-stopping position and to simultaneously close said switch means thus establishing sound reproducing connection between said second electrical vibration pick-up arrangement and said electrical sound reproducing means; and a third stop member arranged in the path of turning of said piano key for engaging the same when it is in said second position with said vibratable steel reed located near said second electrical vibration pick-up arrangement.

10. In an electrical piano a first electric vibration pick-up arrangement, a second electric vibration pick-up arrangement located spaced from said first electric vibration pick-up arrangement, electrical sound reproducing means electrically connected with both said electrical vibration pick-up arrangements, first switch means located in this connection between said electrical vibration pick-up arrangement and said electrical sound reproducing means, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key turnably by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member arranged in the path of turning of said piano key for engaging the same when it is in said first position with said vibratable steel reed located relatively near to said first electrical vibration pick-up arrangement; a second stop member arranged turnably between stopping position located in the path of turning of said vibratable steel reed between said first and said second position and non-stopping position located outside of said path of turning of said vibratable steel reed; electro-magnetic moving means for moving said second stop member from its said stopping position into its said non-stopping position; second switch means combined with said electro-magnetic moving means for operating the same; operating means for simultaneously closing both said switch means whenever desired; and a third stop member arranged in the path of turning of said piano key for engaging the same when it is in said second position with said vibratable steel reed located near said second electrical vibration pick-up arrangement.

11. In an electrical piano a first electric vibration pick-up arrangement, a second electric vibration pick-up arrangement arranged spaced from said first electric vibration pick-up arrangement, electrical sound reproducing means electrically connected with both said electrical vibration pick-up arrangements, first switch means arranged in this connection between said electrical vibration pick-up arrangement and said electrical sound reproducing means, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key turnably by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member arranged in the path of turning of said piano key for engaging the same when it is in said first position with said vibratable steel reed located relatively near to said first electrical vibration pick-up arrangement; a second stop member arranged turnably between stopping position located in the path of turning of said vibratable steel reed between said first and said second position and non-stopping position located outside of said path of turning of said vibratable steel reed; electro-magnetic moving means for moving said second stop member from its said stopping position into its said non-stopping position; second switch means combined with said electro-magnetic moving means for operating the same; operating means for simultaneously closing both said switch means whenever desired; spring means for automatically turning said second stop member from its said stopping position when not held by said electro-magnetic moving means in said non-stopping position; and a third stop member arranged in the path of turning of said piano key for engaging the same when it is in said second position with said vibratable steel reed located near said second electric-vibration pick-up arrangement.

12. In combination a piano key; pivoting means for turnably supporting said piano key; a magnetized member secured to one end of said piano key; and a freely vibratable steel reed secured to the same end of said piano key in contact with said magnetized member.

13. In combination equipped with an electrical vibration pick-up arrangement, a piano key; a magnetized freely vibratable steel reed secured to one end of said piano key; pivoting means turnably supporting said piano key with said freely vibratable steel reed secured to said piano key movably in the pick-up sphere of said electrical vibration pick-up arrangement; and stop means located in the path of turning of said piano key for engaging the same when said free's vibratable steel reed secured to said piano key is located near said electric vibration pick-up arrangement in the pick-up sphere of the same.

14. In combination a piano key; a permanent magnet secured to one end of said piano key; and a freely vibratable reed secured to the same

end of said piano key in contact with said permanent magnet.

15. In an electrical piano equipped with an electric vibration pick-up arrangement, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key turnably by turning said outer operating key portion between a first and a second position being spaced from each other and in both of which positions said vibratable steel reed secured to said holding arm of said piano key is located within the pick-up sphere of said electrical vibration pick-up arrangement; a first stop member located in the path of turning of said piano key for engaging said piano key and abruptly stopping turning of the same causing thereby vibration of said vibratable steel reed secured to said inner supporting key portion of said piano key when said piano key is turned by said outer operating key portion forming part thereof from said second position into said first position; and a second stop member arranged movably between stopping position located in the path of turning of said vibratable steel reed and non-stopping position located outside of said path of turning of said vibratable steel reed.

16. In an electrical piano in combination an elongated stationary inductance coil; sound reproducing means for transforming electrical current created in said elongated inductance coil into audible sound waves; a series of different inductor members located side by side along said elongated inductance coil; a series of supports for said different inductor members each holding one of said different inductor members vibratably in a plane being normal to the longitudinal axis of said elongated stationary inductance coil; and a series of piano key members each serving for vibrating one of said different inductor members in said plane normal to the direction of said longitudinal axis of said elongated stationary inductance coil.

17. In an electrical piano in combination an elongated stationary inductance coil; sound reproducing means for transforming electrical current created in said elongated inductance coil into audible sound waves; a series of elongated magnetized inductor members located in a plane parallel to each other with their tips reaching near said elongated stationary inductance coil; a series of supports for said magnetized inductor members each holding one of said different inductor members vibratably in a plane being normal to the longitudinal axis of said elongated stationary inductance coil; and a series of piano key members each serving for vibrating one of said different inductor members in said plane normal to the direction of said longitudinal axis of said elongated stationary inductance coil.

18. In an electrical piano a series of vibration creating units, each of said vibration creating units comprising a support; a holding member freely movably secured to said support; a stop member arranged in the path of movement of said freely movable holding member for abruptly stopping movement of the same during movement of said holding member; an operating member for moving said freely movable holding member against said stop member; and a vibratable reed secured to said holding member so as to vibrate relative to said holding member when said holding member is moved by said operating means against said stop member and abruptly stopped by the same.

19. In an electrical piano a series of vibration creating units, each of said vibration creating units comprising a support; a holding member freely turnably secured to said support; a stop member arranged in the path of turning of said freely turnable holding member for abruptly stopping turning of the same during turning of said holding member; an operating member for turning said freely turnable holding member against said stop member; and a vibratable reed secured to said holding member so as to vibrate relative to said holding member when said holding member is turned by said operating means against said stop member and abruptly stopped by the same.

20. In an electrical piano a series of vibration creating units, each of said vibration creating units comprising a support; a holding member freely turnably secured to said support; a stop member arranged in the path of turning of said freely turnable holding member for abruptly stopping turning of the same during turning of said holding member; an operating member for turning said freely turnable holding member against said stop member; and a vibratable magnitized steel reed secured to said holding member so as to be adapted to vibrate relatively to said holding member when said holding member is turned by said operating means against said stop member and abruptly stopped by the same.

21. In an electrical piano a series of vibration creating units, each of said vibration creating units comprising a support, a holding member freely turnably secured to said support, a stop member arranged in the path of turning of said freely turnable holding member for abruptly stopping turning of the same during turning of said holding member, an operating member for turning said freely turnable holding member against said stop member, and a vibratable magnetized steel reed secured to said holding member so as to be adapted to vibrate relatively to said holding member when said holding member is turned by said operating means against said stop member and abruptly stopped by the same; an elongated stationary inductance coil arranged extending along said series of vibration creating units within the zone of inductance of said vibratable magnetized steel reeds; and sound reproducing means for transforming electrical current created in said elongated inductance coil into audible sound waves.

OCTAVIO JOSE ALVAREZ.

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TOY PIANO

Raymond J. Lohr, Erie, Pa., assignor to Louis Marx & Company, Inc., New York, N. Y., a corporation of New York

Application August 15, 1939, Serial No. 290,208

13 Claims. (Cl. 84—404)

This invention relates to toys, and particularly to toy pianos.

Toy pianos are already known in which keys are used to strike a xylophone having metallic striking plates, perhaps more properly termed a metallophone. The primary object of my invention is to generally improve toy pianos of this character. A more particular object is to provide a toy piano which is made almost wholly of metal, but which sounds fully as good as, or even better than, a toy piano made of wood.

Another object of my invention is to provide an improved and greatly simplified "action" between the keys and the metallophone, this action being so simplified as to completely eliminate the usual intermediate levers, and the like. Still another object is to improve the pivoting of the keys, and to provide a frictionless and inexpensive mounting making it very easy to assemble the keys in the piano during manufacture. These objects all contribute to make possible low cost manufacture of the toy piano.

Another object of the invention is to provide the piano with a book-top preferably containing well known children's songs in simplified notation, the notes and keys preferably having corresponding numbers to facilitate playing of the piano by an untrained child. The book-top is a simulated piano top which may preferably be made to conform in outline to the configuration of the case of the piano, and which is pivoted so that it may be raised to a position which facilitates reading the music therein. The piano may also be provided with a pivotally mounted support which is adapted when in raised position to hold the book-top in its position of use, the arrangement being such that the support and the book-top may be folded down flat on top of the piano when not in use.

The book-top construction is not claimed herein, it being claimed in my co-pending divisional application Serial No. 398,766, filed June 19, 1941, and entitled "Toy piano."

To the accomplishment of the foregoing, and such other objects as will hereinafter appear, my invention consists in the toy piano elements and their relation one to the other, as hereinafter are more particularly described in the specification, and sought to be defined in the claims. The specification is accompanied by a drawing, in which:

Fig. 1 is a perspective view of the piano with the book-top in closed position;

Fig. 2 is a perspective view with the book-top in open position;

Fig. 3 is a section taken in elevation through the piano in the plane of the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary transverse section across the front of the piano taken in the plane of the line 4—4 of Fig. 3;

Fig. 5 is a horizontal section over the top of one of the folding piano legs, and is taken in the plane of the line 5—5 of Fig. 3;

Fig. 6 is a perspective view showing the construction of one of the keys with attached hammer; and

Fig. 7 is explanatory of a detail of the metallophone construction.

Referring to the drawing, and more particularly to Fig. 1, the piano, in the specific example here illustrated, simulates a grand or baby grand piano. It comprises a case C supported on legs L, and having a row of keys K at the front of the piano. The piano is provided with a top T which preferably conforms, in outline, to the configuration of the piano case. This top is, in reality, a book of music or songs. The top is pivoted at the front of the case and may be raised and supported in an angular position, such as that illustrated in Fig. 2. The book-top may then be opened to expose any one of the series of pages of music or songs therein.

Considering the construction in greater detail, and referring to the remaining figures of the drawing, the book-top comprises a front cover 12 and a back cover 14 which are preferably made of a single piece of cardboard folded at the middle to form a binding portion 16 at the left-hand edge of the book. A series of pages 18 are bound into the book, these preferably also being folded at the middle, and the assembly being stitched, stapled, or otherwise secured, in accordance with methods well known to binders. The book cover is free at the right-hand edge. The cover is slit at the binding for a short distance, thus also freeing the back cover at the lower end of the left-hand edge. These free edges are clamped by reversely folded flanges 20 at the ends of a mounting wall 22. The mounting wall extends across the piano from one side to the other, and may be a narrow strip, as shown, if the back cover 14 is stiff enough to be self-sustaining in shape. If the cover of the book is made of light material, the mounting wall 22 is preferably extended upwardly or widened to better support the book, and the left-hand edge of the book may be clamped at the top as well as at the bottom. The lower edge of mounting wall 22 is preferably flanged forwardly, as is indicated at 23, in order to provide a positive stop at the bottom edge of

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the book. The ends of mounting wall 22 are provided with integrally formed bearing ears 24 which are turned downwardly and pivoted to the side walls of the piano case, as by means of the eyelets 26. It will be evident that with this construction, the mounting wall 22, and with it the book-top T, may be folded down flat on top of the piano case, as shown in Fig. 1, or may be turned upwardly, as is indicated in Fig. 2.

When the book-top is turned upwardly, it is supported in raised position, by means of a suitable top support. In the present case the support is a piece of wire 30, which is extended horizontally rearwardly at 32, then downwardly at 34, and then again bent horizontally at 36. The horizontal portion 32 acts as a pivot, it being received in a hole through a flange 38 on the top wall 42 of the piano case, and also being received in a bearing ear 40 which is struck downwardly from the top wall 42. The portions 34 and 36 of support 30 are not essential, but are preferably added in order to provide detent means to hold the support 30 in upright position. Specifically, the part 36 bears against the bottom wall 44 of the piano case when the support 30 is in upright position. Referring to Fig. 4, it will be seen that bottom wall 44 is indented at 46 and 48 to form a detent which receives the part 36. Inasmuch as the bottom 44 of the piano case is somewhat resilient, it yields downwardly when the part 36 is forced between the indentations 46 and 48. It will be understood that the support 30 may be turned sidewardly to a horizontal position, the part 36 then being moved out of locking engagement with the bottom of the case and rising until it rests against the top wall 42. At this time the support 30 is in horizontal position and lies below the level of top wall 42, and therefore does not interfere with folding of the book-top flat against the top of the piano case.

The mechanism or "action" of the piano is extremely simple. The keys K are short and are pivoted near their rear ends. The short rearward extensions 50 (Figs. 3 and 6) of the keys have strips of material 52 secured thereto. The strips are preferably long, slender springs in strip or ribbon form, and each has a hammer head 54 at its rear end. The hammer head 54 is preferably made of a short piece of metal rod, the upper end of which is rounded, and the lower end of which is necked and riveted through a hole in the end of the spring. This provides a slightly weighty, upwardly directed hammer. The metallophone, generally designated M, extends across the piano from one side to the other and is disposed at a level higher than the row of keys K. The metallophone plates are located over the hammers, and it will be evident from inspection of Fig. 3, that on depressing any one of the keys the hammer 54 will be raised to strike the corresponding metallophone plate, as is indicated by the change in position from 52, 54 to 52', 54'. Because of the extremely light, springy nature of the springs 52, there is no interference with proper vibration of the metallophone plate, even if the key is held in depressed position. The keys K are preferably formed of sheet metal. Each key is made of a single piece of sheet metal which is bent downwardly at its edges to form a hollow key which is open at the bottom. The side edges 56 (Fig. 6) are upwardly notched at 58 to fit over a fulcrum strip 60 (Fig. 3) which extends from one side of the piano to the other. The fulcrum strip 60 is preferably L-shaped in section, and is secured in position by tongue and slot connections 62 at its ends which pa... the side walls of the piano case. It ma... preferably is additionally secured in p... plurality of tongue and slot connecti... at the bottom of the piano case, one ... being indicated at 64 in Fig. 3.

The fulcrum strip 60 is preferably ... slightly along its upper edge, as is indi... in Fig. 4. These notches may be sma... desirable to locate the keys against ... movement and to space the same ... apart. The keys are held on the fulcr... by a retainer strip 68, best shown in Fi... lower edge of said strip being disposed ... over the upper edge of fulcrum strip 6... upper edge of retainer strip 68 may be ... rearwardly at 70 to stiffen the same and ... the piano a more finished appearance. ... tainer strip is secured in position by ... slot connections 72 at the ends of the p... tongues 72 passing through the side wa... piano case. If desired, the lower edge of ... er strip 68 may be provided with a strip of ... ioning material 74, this preferably being a ... of small diameter tubular material which ... gitudinally slit to be received over the lo... of the retainer strip. The material may ... ber coated fabric, such as the so-called ... ghetti" often used for electric insulating ... poses.

The metallophone itself is generally c... tional, but the manner in which the m... phone plates are supported deserves m... The plates are supported on two diverging ... as is conventional, but these strips are ... present case formed of sheet metal which ... to L-shaped configuration with the hor... part on top, as is best shown at 76 in F... The ends of these strips are secured betw... side walls of the piano case by appropriate ... and slot connections 78. A series of T-... lugs 80 are struck upwardly from the st... as is best shown in Figs. 3, 4 and 7. T... shaped lugs 80 are received in holes 82 ... through the ends of the metallophone ... these holes having slots 84 which are d... sioned to receive the T-shaped lugs 80, but ... are normally disposed perpendicular to t... shaped lugs. Thus, the metallophone m... initially assembled by twisting the lugs 8... lowing which the plates are held loosely, a... should be, but are incapable of falling out ... sition if the piano is turned upside down. ... lugs need be twisted at only one end, for ... other end the entire plate may be oriented ... receive the lug.

The forward ends of spring 52 are pref... secured to the keys in the following manner ... rear end wall 86 (Fig. 6) of each key is ... to receive the spring 52, and the top wall ... forated to receive an eyelet 88. The end ... spring is passed through the slot into the ... interior of the key, and is then eyeletted ... the top wall of the key by means of the ey...

Inasmuch as the piano is made entir... sheet metal, it is desirable to provide ... buffer strips made of fibrous material, s... fabric or felt. One such strip of mate... indicated at 90 in Figs. 3 and 4, this str... tending beneath the keys and preventing ... metallic sound resulting from the lower e... the key striking the bottom of the piano ... other such strip is indicated at 92 in Figs. ... 4, this strip extending over the bottom ... piano beneath the hammer 54. The s...

...d in place by a number of tongues 94 which ...struck upwardly from the bottom 44 of the ... Strip 92 acts as a cushion and sound ... medium to prevent any metallic sound ... a piano key is released and the hammer ... against the bottom of the piano. Finally, ... 96 are preferably disposed on top of the ...lophone supports 16. These may consist ... of heavy strands of wool yarn which are ... the tops of the strips.

The legs L, of the piano, are preferably arranged to fold up against the bottom of the ... for more compact packaging, this being ... of greater convenience during storage ... shipment of the toy. Referring to Fig. 3, ... is formed of a main piece of sheet metal ... is longitudinally folded four times to form ... leg of square section. The seam, where ... edges of the metal meet, is preferably disposed at the inside of the leg, as is indicated at ... Fig. 3. At its lower end, extensions of the ... are turned inwardly, as is indicated at ... partially close the bottom end of the leg. ... upper end the leg is secured to a small ... 104, the parts being attached by means ... bent tongue and slot connections 106. Top ... 104 is provided with a pair of extensions ... 108 (Fig. 5) which are bent or curled ... form hinge sleeves. These are received on ... pins 110 which are formed by providing ... bottom 44 of the piano with a pair of closely ... collateral slots 112. The material, between slots 112, acts as the hinge pin 110. At ... opposite end the top plate 104 is provided ... another extension or tongue 114 which is so ... as to act as a spring detent. It cooperates with a guide lug 116 struck downwardly ... the bottom 44 of the piano. It will be ..., on study of the drawing, that with this ... the legs may be folded inwardly ... the solid line position to the broken line ... 118'.

The legs are preferably so mounted as to be ... in different directions. For example, the ... leg 118 may fold forwardly, as shown at ... while the front legs may fold sidewardly ... toward one another. In the present ... the rear leg 118 folds forwardly and the ... leg 120 folds rearwardly, while the front ... 122 folds sidewardly, as is indicated by the ... in Fig. 2. This folding of the legs in different direction is not at all essential, but is ... desirable in order to help add stability when the legs are in use. The legs, of ..., clear one another when folded and thus ... the size of the carton needed to box ... piano.

The case of the piano may be assembled out ... of sheet metal patterned in a number of ... but I prefer the method of assembly here ... The bottom 44 is a single, large ... of sheet metal, the front edge of which is ... upwardly at 124 (Fig. 3) and rearwardly ... to form a suitable ledge at the keyboard. ... bottom 44 is provided with extensions at its ... which are folded upwardly to form the ... side walls 128 and 130. These are ... turned inwardly at the top to form ... 131. The curved or contoured rear edge ... wall 44 is flanged upwardly for a short ... at 132, as is shown in Fig. 3.

The rear wall of the piano consists of a separate strip of sheet metal 134 which is readily ... to the desired curved outline. It is secured ... wall 44 within flange 132 by appropriate bent tongue and slot connections, one of which is indicated at 136. Its ends are secured to the side walls 128 and 130 by bent tongue and slot connections 138. The case is completed by the top wall 42, the curved periphery of which is downwardly flanged at 140. The top wall is secured to the side wall 134 by bent tongue and slot connections 142. The top wall 42 preferably terminates well behind the front edge of the piano in order to provide plenty of room for sound egress. In the present case, it terminates at the flange 38 which is disposed approximately over the middle of the metallophone. The key retaining strip 68, which finishes the front of the piano case, has already been described.

It is believed that the construction and operation, as well as the many advantages of my improved toy piano will be apparent from the foregoing detailed description thereof. It will also be apparent that while I have shown and described my invention in a preferred form, many changes and modifications may be made in the structure disclosed without departing from the spirit of the invention as sought to be defined in the following claims.

In the claims the term "metallophone" is intended to also include a xylophone and like equivalents. The reference in some claims to the piano case simulating a "baby grand piano" is intended to include a simulation of a grand piano and intermediate variations.

I claim:

1. A toy piano comprising a row of simulated piano keys, a metallophone extending across said piano, a slender spring wire secured directly to each key, a hammer head at the end of each spring wire, the parts being so arranged that depression of a key causes the hammer to strike a corresponding metallophone plate.

2. A toy piano comprising a case, a keyboard including a row of pivoted simulated piano keys at the front of said case, a metallophone extending across said piano from side to side at a level higher than the keyboard, a strip of material secured directly to and extending rearwardly from each key to a point beneath the metallophone, and a hammer head at the end of each strip, whereby depression of a key causes the hammer to rise and strike a corresponding metallophone plate.

3. A toy piano comprising a case simulating a baby grand piano, a keyboard including a row of pivoted simulated piano keys at the front of said case, a metallophone extending across said piano from side to side at a level higher than the keyboard, a slender leaf spring secured directly to and extending rearwardly from each key to a point beneath the metallophone, and an upwardly pointed metallic hammer head at the end of each spring, said spring and head constituting a hammer, whereby depression of a key causes the hammer to strike a corresponding metallophone plate, said key being restored by the weight of the hammer.

4. A toy piano comprising a row of simulated keys, a fulcrum strip for the keys extending from one side of the piano to the other, each key being notched upwardly to fit around the upper edge of the fulcrum strip, and a continuous retainer strip above the keys to hold the keys on the fulcrum strip.

5. A toy piano comprising a row of simulated keys, each key being a hollow sheet metal part which is open downwardly, a fulcrum strip for

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the keys extending from one side of the piano to the other, the longitudinal or side walls of each key being notched upwardly to fit around the upper edge of the fulcrum strip, a retainer strip extending from one side of the piano to the other directly above said keys, said retainer strip functioning to hold the keys on the fulcrum strip.

6. A toy piano comprising a piano case, a keyboard at the front of the piano comprising a row of simulated keys, each key being a hollow sheet metal part which is open downwardly, a fulcrum strip for the keys extending from one side of the piano to the other, the longitudinal or side walls of each key being notched upwardly to fit around the upper edge of the fulcrum strip, the top edge of the fulcrum strip being notched to hold the keys against sideward movement, a retainer strip extending from one side of the piano to the other directly above said keys with its lower edge in substantially the same plane as the fulcrum strip, said retainer strip functioning to hold the keys on the fulcrum strip.

7. A toy piano comprising a piano case, a keyboard at the front of the piano comprising a row of simulated keys, a fulcrum strip for the keys extending from one side of the piano to the other, each key being notched upwardly to fit around the upper edge of the fulcrum strip, a retainer strip extending from one side of the piano to the other directly above said keys, said retainer strip functioning to hold the keys on the fulcrum strip, a metallophone extending across said piano from side to side at a level higher than the keyboard, a strip of material secured directly to and extending rearwardly from each key, and a hammer head on each strip, whereby depression of a key causes the hammer to strike a corresponding metallophone plate.

8. A toy piano comprising a piano case, a keyboard at the front of the piano comprising a row of simulated keys, each key being a hollow sheet metal part which is open downwardly, a fulcrum strip for the keys extending from one side of the piano to the other, the longitudinal or side walls of each key being notched upwardly to fit around the upper edge of the fulcrum strip, a retainer strip extending from one side of the piano to the other directly above said keys, said retainer strip functioning to hold the keys on the fulcrum strip, a metallophone extending across said piano from side to side at a level higher than the keyboard, a slender leaf spring secured to and extending rearwardly from each key to a point beneath the metallophone, and an upwardly pointed metallic hammer head at the end of each spring, said spring and head constituting a hammer, whereby depression of a key causes the hammer to strike a corresponding metallophone plate, said key being restored by the weight of the hammer.

9. A toy piano comprising a piano case made of sheet metal and simulating a baby grand piano, a metallophone extending across the inside of said case, a row of simulated piano keys with associated mechanism to strike the metallophone, said case comprising a single large piece of metal bent upwardly and then rearwardly at the front edge to form a ledge at the keyboard, a strip of sheet metal bent to form the rear of the case, and a cover wall secured at the top of said rear wall.

10. A toy piano comprising a piano case of sheet metal, a metallophone support strip extending from one side wall to the other, said strip having a series of lugs struck upwardly therefrom, a series of metallophone plates extending across said strip and having holes which loosely receive said lugs.

11. A toy piano comprising a piano case of sheet metal and simulating a baby grand piano, said case comprising a single piece of sheet metal bent upwardly and then rearwardly at the front edge to form a ledge at the keyboard, a strip of sheet metal bent to form the rear edge of the case, a cover wall secured at the top of said rear, a fulcrum strip extending from one side wall to the other beneath the keyboard, a retainer strip extending from one side wall to the other above the keys and fulcrum strip, a metallophone support strip extending from side wall to the other, said strip having a series of lugs struck upwardly therefrom, a series of metallophone plates extending across said strip and having holes which loosely receive the lugs.

12. A toy piano comprising a case simulating a baby grand piano, a keyboard including a series of pivoted simulated piano keys at the front of said case, a metallophone extending across the piano from side to side at a level higher than the keyboard, a strip of material secured at one end and extending rearwardly from each key to a point beneath the metallophone, and an upwardly pointed hammer head at the end of each strip, said strip and head constituting a hammer, whereby depression of a key causes the hammer to strike a corresponding metallophone plate, said key being restored by the weight of the hammer.

13. A toy piano comprising a piano case, a keyboard at the front of the piano comprising a series of simulated keys, each key being a hollow sheet metal part which is open downwardly, a fulcrum strip for the keys extending from one side of the piano to the other, the longitudinal or side walls of each key being notched upwardly to fit around the upper edge of the fulcrum strip, a retainer strip extending from one side of the piano to the other directly above said keys, said retainer strip functioning to hold the keys on the fulcrum strip, a metallophone extending across said piano from side to side at a level higher than the keyboard, a strip of material secured directly to and extending rearwardly from each key to a point beneath the metallophone, and an upwardly pointed hammer head at the end of each said strip and head constituting a hammer, whereby depression of a key causes the hammer to strike a corresponding metallophone plate, said key being restored by the weight of the hammer.

RAYMOND J.

June 6, 1950 E. O. FLEURY 2,510,094

MUSICAL INSTRUMENT

Filed May 25, 1946 2 Sheets-Sheet 1

Fig. 1.

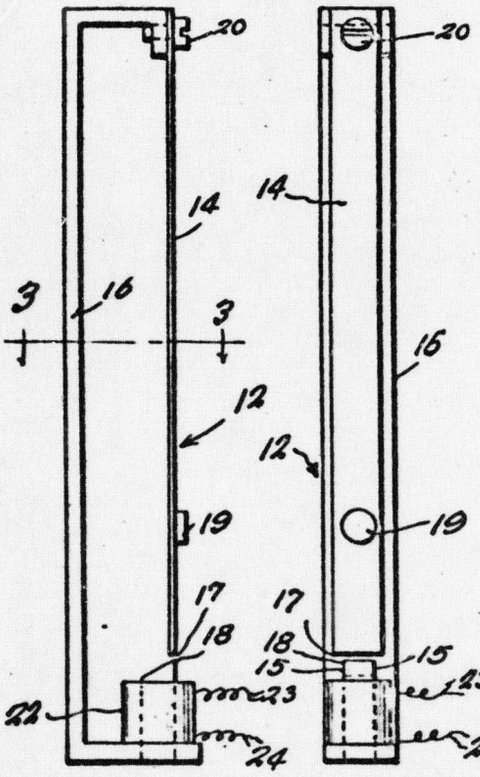


Fig. 2.

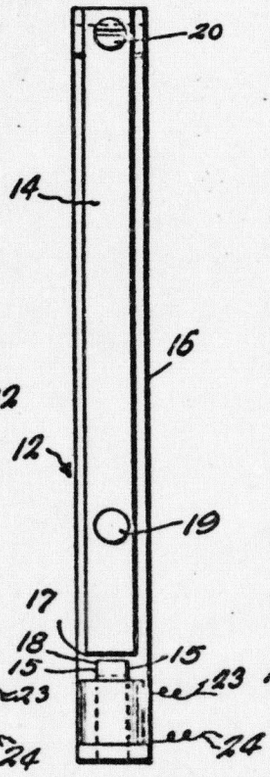


Fig. 3

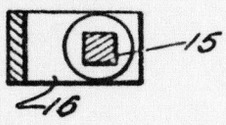


Fig. 6.

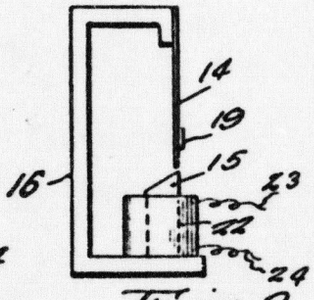


Fig. 7.

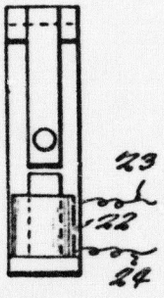


Fig. 8.

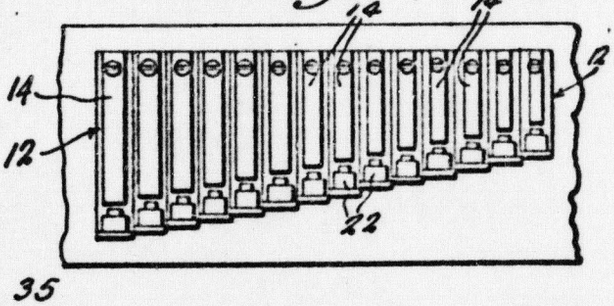
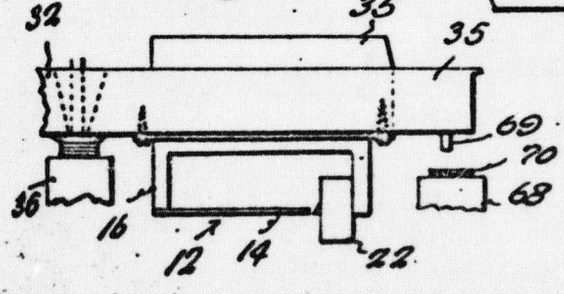


Fig. 9.



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June 6, 1950 E. O. FLEURY 2,510,094

MUSICAL INSTRUMENT

Filed May 25, 1946 2 Sheets-Sheet 2

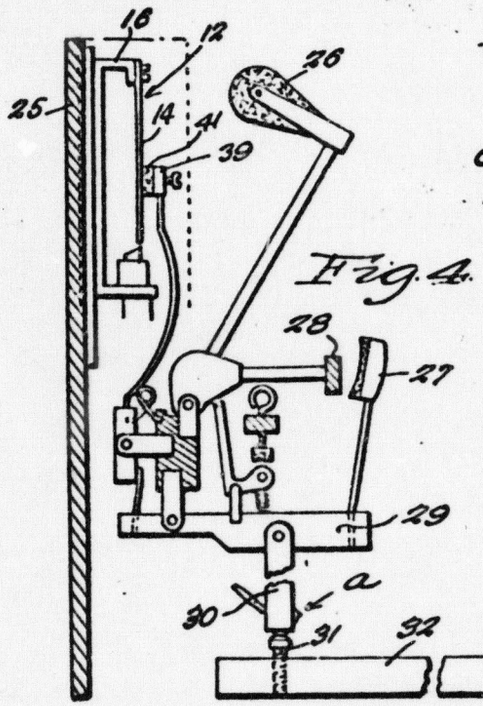


Fig. 4.

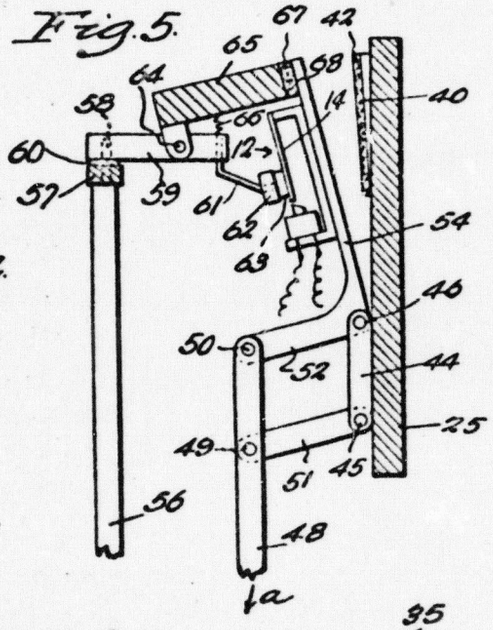


Fig. 5.

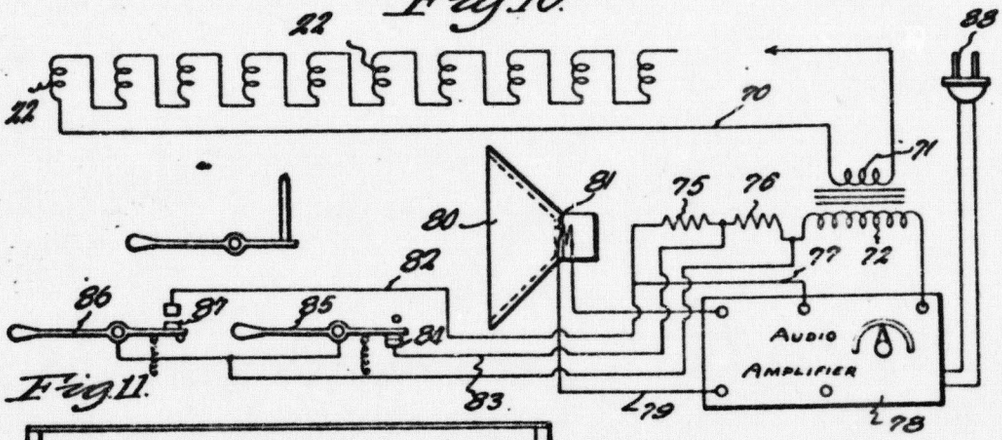
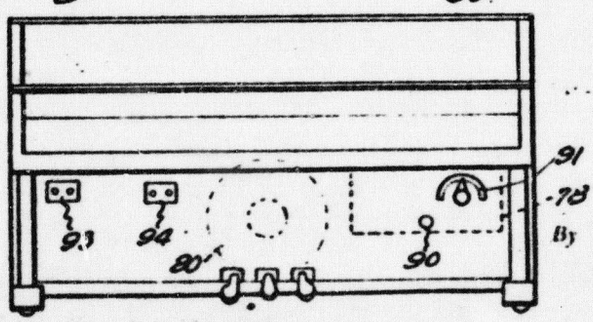


Fig. 10.

Fig. 11.



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Patented June 6, 1950 2,510,094

UNITED STATES PATENT OFFICE

2,510,094

MUSICAL INSTRUMENT

Evariste O. Fleury, Lewiston, Maine

Application May 25, 1946, Serial No. 672,223

6 Claims. (Cl. 84—1.15)

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This invention relates to musical instruments, and more particularly to musical instruments operated by keys. The principal object of the invention consists in providing a musical tone or note producing unit which, when operated, generates electrical oscillations of the exact frequency corresponding to the musical tone or note associated with the key. These electrical oscillations may then be used to operate an electro-acoustic sound production system.

A further object of the invention consists in providing a unit of the type mentioned which produces the electrical oscillations by means of a reed or flat spring having a natural frequency with which it will oscillate, if receiving impulses either directly or by using its inertia. The natural frequency of a reed is defined very exactly and therefore permits to obtain clear tones.

A still further object of the invention consists in making the reed operative by placing it into a magnetic circuit in alignment with a core carrying a coil, the said two members serving to close said magnetic circuit completely with the exception of a small gap left between them. Preferably the cross sections of the reed and the core facing each other on both sides of said gap are approximately the same so that the vibration of the reed will cause a regular or sinusoidal variation of the magnetic flux, and of the current induced thereby in the coil carried by said core.

A further object of the invention consists in providing a musical instrument, using the aforesaid units for producing electrical oscillations of a frequency corresponding to a definite musical tone or note, in which the keys allotted to each musical tone or note are operating a mechanism provided with a striking member or a mechanism adapted to impart a rapid movement to one of the units, which movement is automatically and suddenly arrested. In the first case the vibration is caused directly by the impact of said striking member on the vibrating reed, while in the second case the inertia of the reed causes vibration with natural frequency. The movement of the striking member or of the movable member supporting the above described unit may either be produced by means of a so-called action or it may be produced by attaching the note producing units directly to the keys.

A still further object of the invention consists in providing a volume control of the sound produced which may be either mechanical and may consist in means for regulating the damping of the oscillations of the reed or may be electrical, the latter method being preferable in cases in

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which mechanical control entails constructive difficulties or in which the sound volume control is intended to be carried beyond the limits within which mechanical means will operate.

Further objects will be apparent from the following detailed specification describing several embodiments of the invention. It is to be understood that these embodiments are examples for illustrative purposes and are not intended to be limitative. The invention is described in such terms that the expert skilled in this art will readily understand that certain details and constructional features are subject to change without in any way departing from the invention.

In the accompanying drawings:

Figures 1 and 2 are elevational side and front views, respectively, of a single tone producing unit according to the inveniton.

Figure 3 is a cross sectional plan view of said unit, the cross section being taken along the line 3—3 of Figure 1.

Figure 4 is an elevational side view of one embodiment of the invention using the so-called action now used for striking the piano strings and for damping the oscillation for operating the tone producing units according to the invention.

Figure 5 is an elevational side view of a modification of the action specially adapted for the purpose in question.

Figures 6 and 7 are elevational side views similar to those of Figures 1 and 2 showing units used for the highest tones.

Figure 8 is an elevational side view of the back board of a piano with the tone producing units shown in Figures 4, mounted thereon.

Figure 9 is an elevational side view of another tone producing arrangement in which no action at all is used, the tone producing unit being directly attached to the keys of the piano.

Figure 10 is a diagram showing the general arrangement and the electric connections of the modification illustrated in Figure 9 or in Figure 5.

Figure 11 is an elevational view of a complete piano, illustrating the arrangement of the main components.

In order to explain the object of the invention in general terms, it may be mentioned that it is the main purpose of the invention to produce electrical oscillations corresponding exactly to the musical tone which is allotted to each key of the piano or other musical instrument. While the keyboard and the operational method of producing music by depressing keys corresponding to

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certain notes remains essentially unchanged, the oscillations directly produced by the keys are not sound vibrations but are electrical oscillations which may be reproduced in the usual manner by a loud speaker, by a telephone or the like or may be recorded in the well known manner. This electrical reproduction method permits a far better regulation of the volume of sound delivered and it may even be used—in the event that music is practiced—in such a way that merely the operator, or a selected number of persons, is enabled to hear the music produced; a result which is easily obtained by using earphones. Conversely, a piano of the type described may be used with a volume of sound which exceeds by far that which can be produced by the conventional type of piano, so that music for a large open air audience, dance music for open air, or for a plurality of rooms, etc., may be produced individually without the intermediation of a public address system which, as a rule, is imperfect from a musical point of view.

The main element of the invention consists in the tone producing unit 12, allotted to each key of the piano or other musical instrument, which replaces the piano string conventionally used. This unit consists of a flat spring or reed 14 of a predetermined length attached to a frame 16 of magnetically permeable material, which is closed on three sides and open at the fourth side. This open side is partly closed by the reed 14 and partly by a core 15 of magnetically permeable material projecting from the frame towards the spring. Only a small gap 17 is left between these two parts. The core may be bevelled so that it tapers toward the edge 18 facing the reed 14. The magnetic lines of force are thus concentrated in a zone corresponding to the cross section of the spring.

The reed may, if necessary, be loaded by a weight 19. It is fixed at one end on the frame 16 by means of a screw 20. A reed or flat spring attached at one end has, as well known a very exactly defined natural frequency or resonance frequency, determined by its own free length, if not loaded, or by the distance of the center of gravity of the oscillating system from the point of attachment, if loaded. The reed or spring of each unit is, therefore, so selected that its natural frequency corresponds to that of the musical tone or note to be produced by one key.

The core 15 is surrounded by a coil 22 provided with fine windings, the wire leading to and from said coil being indicated at 23, 24.

The frame is preferably laminated and consists of a large number of lamellae. Said frame is magnetized so as to form a magnet.

It will be clear that if the reed 14 or the frame is struck by some device or if it is moved and its movement is suddenly arrested it will leave its central position of rest and will oscillate with its natural frequency. The magnetic reluctance of the system which was closed over the small gap 17 when the reed was at rest will vary in accordance with this oscillation and currents corresponding to said oscillations will be set up in the coil 22.

To start oscillations of the reed, the conventional mechanism, called action, may be used as illustrated in Figure 4. The units 12 may be aligned along the back board 25 of the piano or other instrument as no resonance board or the like is necessary (see Figures 4 and 8). These units as is seen differ as regards the free length of the reed and the length of the frame 16 varies correspondingly. However, the cores 15 and coils 22 are preferably the same for all spring lengths.

The conventional action such as shown in Figure 4 need not be described in detail as the mechanism is identical with the standard mechanism now used. It comprises the hammer 26, the check 27, cooperating with the back stop 28, the wippen 29, the prolong 30, cooperating with the capstan screw 31 directly operated by the key lever 32 which forms a continuation or projection of the key 35 which turns around the balance rail 36.

The damping mechanism again is practically identical with the damping mechanism as conventionally used and comprises the damper block 39, the head 41 of which is applied against spring 14 of the unit 12, much in the same way in which it is usually applied against the piano string.

The conventional action now in use which was developed for piano strings, although suitable to operate units according to the present invention may, however, be simplified to a marked degree.

This simplification is shown in Figure 5 in which the back board 25 does not carry the units but is provided with the check 40 which in this case consists of a wedge-shaped member lined with felt 42. It also carries a rail 44 which supports two pivot pins 45, 46. The prolong 48 which cooperates with the capstan screw 31 and key lever 32 in the way shown in the lower part of Figure 4 marked by reference letter *a*, is provided with two further pivot pins 49, 50, and is linked to the rail 44 by means of links 51, 52, turning around the pivot pins 49, 50 and 45, 46. Thus a lever parallelogram is formed which will keep the prolong 48 in its vertical position while moved by the key. The link 52 may form part of or may be connected with a bracket 54 extending upwardly from the lever parallelogram and carrying the note or tone producer unit 12.

The damping mechanism in this case is operated by the pedal rod 56, which is connected with one of the pedals of the piano. At its upper end the pedal rod 56 carries an action rail 57 which is provided with pins 58 holding action levers 59. A felt washer 60 may be interposed between said rail and sail levers and centered around the pins 58.

Each action lever 59 carries a damper wire 61 at the end of which the damper block 62 is attached. The block 62 carries the damper head 63 made of suitable material such as a piece of fur of piled fabric and the like which is to be applied against the reed 14 of the unit 12.

The action lever 59 is pivoted at 64 on a stationary supporting rail 65 and is held in its position of rest by a spring 66. The supporting rail may project towards the bracket 54, and may be provided with an end surface 67 which is parallel to the bracket 54 when at rest and is heavily lined with felt 68 in order to form a back stop for the moving parts of the mechanism.

It will be clear from the above that the downward movement of key 35 causes an upward movement of capstan screw 31 and of prolong 48 which will move the bracket 54 against the back wall 35. This movement is suddenly stopped by the felt 42 on member 40; the reed 14 of the unit 12, therefore, starts its oscillations which will last until the bracket 54 falls back. When the bracket returns the starting of a new series of oscillations is effectively prevented by the back stop felt 67.

The oscillations of the reed are effectively damped by damper head 62, held against the reed

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by spring 66. If the oscillations should continue, the sustaining pedal is operated whereby the rail 57 is moved and lifts the damper head from the reed 14.

A further simplification of the arrangement results if the note or tone producing units 12 are directly fixed on the keys 35 as shown in Figure 9. Preferably the units are fixed on the keys between the keybed frame 68 and the balance rail. Each key is, as usual, provided with a stop pin 69 striking against a felt pad 70 on the keybed frame 68. To increase the force necessary to move the keys and to make it equal to the force necessary to move a key against the resistance of the action now in use, the key levers 32 may be loaded by means of weights (now shown).

The means for translating the electrical oscillations into sound oscillations are shown in Figures 10 and 11. This Figure also shows an electric volume control of the tones which may be applied instead of the mechanical volume controls produced by damping in those cases in which the introduction of a mechanical control entails constructional complications.

In Figure 10, the coils 22 are all arranged in series although other connections would be possible likewise. These coils form part of a circuit 70 which may or may not be provided with an amplification stage and which is closed by the step up transformer 71. The secondary 72 of the transformer is connected in series with two resistances 75 and 76 which are provided for volume control purposes. The entire circuit 77 containing the said elements forms the input circuit of an audio amplifier 78 having as many amplification stages as the purpose of the instrument may require. The output circuit 79 of said amplifier is connected with the voice coil 81 of the loud speaker 80.

The two resistances 75 and 76 have parallel circuits 82, 83 by means of which they may be short circuited. One of these circuits 83 may be permanently closed by means of the contacts 84 of the pedal 85. The second circuit 82 is open at the contacts 87 as long as the loud pedal is not operated.

A sustaining pedal may be used in addition if, for instance, an arrangement similar to that shown in Figure 5 is employed. In this case the sustaining pedal may operate the pedal rod 56.

It will be clear that the oscillations produced by the depression of a key of the instrument will induce currents in coils 22, the voltage of which is stepped up in the transformer while currents are magnified by the amplifier or amplifiers used. These currents act on the loud speaker 80. They have to pass resistance 75 while resistance 76 is normally short circuited. If the forte or loud pedal 86 is operated it closes a short circuit around resistance 75 and no resistance is then included in the input circuit of the audio amplifier 78. The notes produced will, therefore, have maximum volume. If soft pedal 85 is pressed the short circuit to resistance 75 is interrupted and this resistance is now active in series with resistance 75. The volume will, therefore, be cut down to a minimum.

The amplifier or amplifiers may be supplied with current from any suitable source of electrical energy, a plug connection 88 being shown for this purpose.

The piano equipped with the tone or note producer units may have approximately the shape of a conventional piano. Figure 11 shows the outline.

The speaker may be arranged in the center of the back wall or in the center of the front wall above or below the key frame, the latter case being shown in the Figure. The audio amplifier 78 is best arranged on one side with its front wall carrying the switch 89 and the main adjustment control 91 projecting outwardly. The adjustment control has only to be operated occasionally and readjustment is only necessary at long intervals, or with a change of the use to which the instrument is put. The switch 89 has to be operated before use of the piano. The plug in contacts 93, 94 may be used for earphones or for the connection of the piano with a distant speaker.

It will be clear that the quality of the music instrument may be improved in many ways, if desired. For instance, if it is desired to produce not only the basic musical note but also certain harmonics a plurality of juxtaposed units or of juxtaposed reeds and coils may be substituted for the single unit.

Moreover, it will be clear that the mechanical and electrical details of mechanisms have been specifically described merely in order to be able to illustrate the principles by means of specific examples, but, as it is the principle which constitutes the invention, these specific details may be replaced by others without in any way affecting the invention.

I claim:

1. A device for use in musical instruments for producing musical tones by means of electrical oscillations, comprising a key, a unit for translating mechanical oscillations of a frequency corresponding to the frequency of the musical tone to be produced into electrical oscillations, said unit including a frame of magnetized ferro-magnetic material open along one side, a magnet core with a reduced substantially linear end face, a flat strip-like transversely oscillating reed with one freely oscillating and one fixedly supported end of a predetermined free length corresponding to a predetermined natural frequency of transverse oscillations, having a substantially linear end face at its free end, said magnet core and said transversely oscillating reed being longitudinally aligned and being mounted on opposite sides of said frame, projecting towards each other along the open side of the said frame and substantially closing the open side of the frame, with their substantially linear end faces facing each other across a narrow gap, a coil mounted on said magnet core with its longitudinal axis extending along the axis of said core for producing currents induced by the variation of the magnetic flux through said core, means operated by the key for moving said unit, a fixed member for arresting said movement and for causing an impact producing a vibration of the reed with its natural frequency and an electro-acoustic translation means for translating the electrical oscillations into sound oscillations.

2. A device for use in musical instruments for producing musical tones by means of electrical oscillations, comprising a key, a unit for translating mechanical oscillations of a frequency corresponding to the frequency of the musical tone to be produced into electrical oscillations, said unit including a frame of magnetized ferro-magnetic material, open along one side, a magnet core with a reduced substantially linear end face, a flat strip-like transversely oscillating reed with one freely oscillating and one fixedly supported end of a predetermined free length corresponding

to a predetermined natural frequency of transverse oscillations, having a substantially linear end face at its free end, said magnet core and said transversely oscillating reed being longitudinally aligned and being mounted on opposite sides of said frame, projecting towards each other along the open side of the said frame and substantially closing the open side of the frame, with their substantially linear end faces facing each other across a narrow gap, a coil mounted on said magnet core with its longitudinal axis extending along the axis of said core for producing currents induced by the variation of the magnetic flux through said core, means operated by said key to impart a rapid motion to said unit, means to arrest said motion to cause the reed to oscillate with its natural frequency, and an electro-acoustic translation means for translating the electrical oscillations into sound oscillations.

3. A device for use in electrical musical instruments, producing electrical oscillations corresponding to a musical tone comprising a magnetized frame of ferro-magnetic material open along one side, a magnet core with a reduced substantially linear end face, a flat, strip-like, transversely oscillating reed with a freely oscillating and a fixedly supported end of a predetermined free length corresponding to a predetermined natural frequency of its transverse oscillations, said reed having a substantially linear end face at its free end, said magnet core and said transversely oscillating reed being longitudinally aligned and being mounted and projecting from oppcsite sides of the frame toward each other along the open side of the said frame, so as to substantially close said open side, with the substantially linear end faces of the core and the free end of the reed facing each other across a narrow gap, a coil on said magnet core with its longitudinal axis extending along said core for producing electrical oscillations and mechanical means for producing a vibration of the reed with its natural frequency.

4. A device for use in musical instruments producing musical tones by means of electrical oscillations comprising a unit for translating mechanical oscillations of a frequency corresponding to the frequency of the musical tone to be produced into electrical oscillations, said unit including a frame of magnetized ferro-magnetic material, open along one side, a magnet core with a reduced substantially linear end face, a flat strip-like transversely oscillating reed with a freely oscillating end and a fixedly supported end of a predetermined free length, corresponding to a predetermined natural frequency of its transverse oscillations, having a substantially linear end face at its free end, said magnet core and said transversely oscillating reed being longitudinally aligned and being mounted on opposite sides of said frame, and projecting towards each other along the open side of the said frame, said core and said reed substantially closing the open side of the frame with their substantially linear end faces facing each other across a narrow gap, a coil mounted on said magnet core with its longitudinal axis extending along the said core for producing currents induced by said core, a key, carrying said unit, said unit being fixedly attached to said key, with the reed in substantial parallelism to said key, means for arresting the movement of said key, to produce an oscillation of the reed by inertia upon arrest of the key and an electro-acoustic translation means for translating the electrical oscillations into sound oscillations.

5. A device for use in musical instruments for producing musical tones by means of electrical oscillations comprising a key, a unit for translating mechanical oscillations of a frequency corresponding to the frequency of the musical tone to be produced into electrical oscillations, said unit including a frame of magnetized ferro-magnetic material open along one side, a magnet core with a reduced substantially linear end face, a flat strip-like transversely oscillating reed with a freely oscillating end and a fixedly supported end of a predetermined free length, corresponding to a predetermined natural frequency of its transverse oscillations, having a substantially linear end face at its free end, said magnet core and said transversely oscillating reed being longitudinally aligned and being mounted on opposite sides of said frame, projecting towards each other along the open side of said frame and substantially closing said open side, with the substantially linear end face of the core and the free end of the reed facing each other across a narrow gap, a coil mounted on said magnet core with its longitudinal axis extending along said core for producing induced currents, a rigid backboard, a support for said unit pivoted to said rigid backboard, a mechanical link connection between said pivoted support and said key, adapted to produce a motion of said pivoted support towards said fixed backboard, cushioning means on the latter arresting the movement of the pivoted support, a further rigid support, forming a rest for the support of the unit, damping means applied against the reed in the position of rest, said means being pivotally mounted on said further rigid support, a pedal and means for connecting said pivoted damping means with said pedal.

6. A musical instrument provided with a number of devices according to claim 1 wherein the electro-acoustic translation device includes two resistances arranged in series, shunt circuits across each of said resistances, and two pedals, each provided with a contact for controlling one of said shunt circuits.

EVARISTE O. FLEURY.

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TOY PIANO

Filed Oct. 18, 1935 3 Sheets-Sheet 1

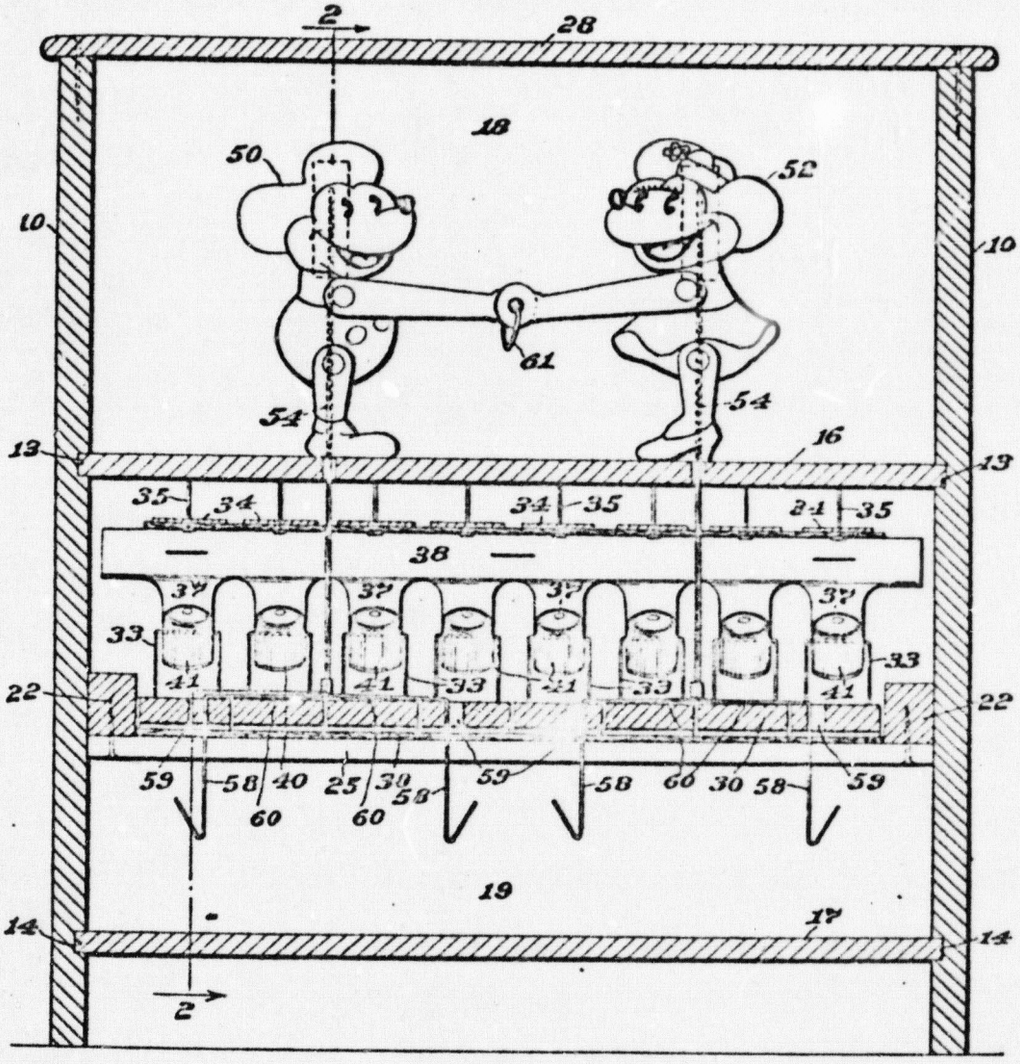

Fig. 1

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Sept. 1, 1936. I. MARKS 2,052,890

TOY PIANO

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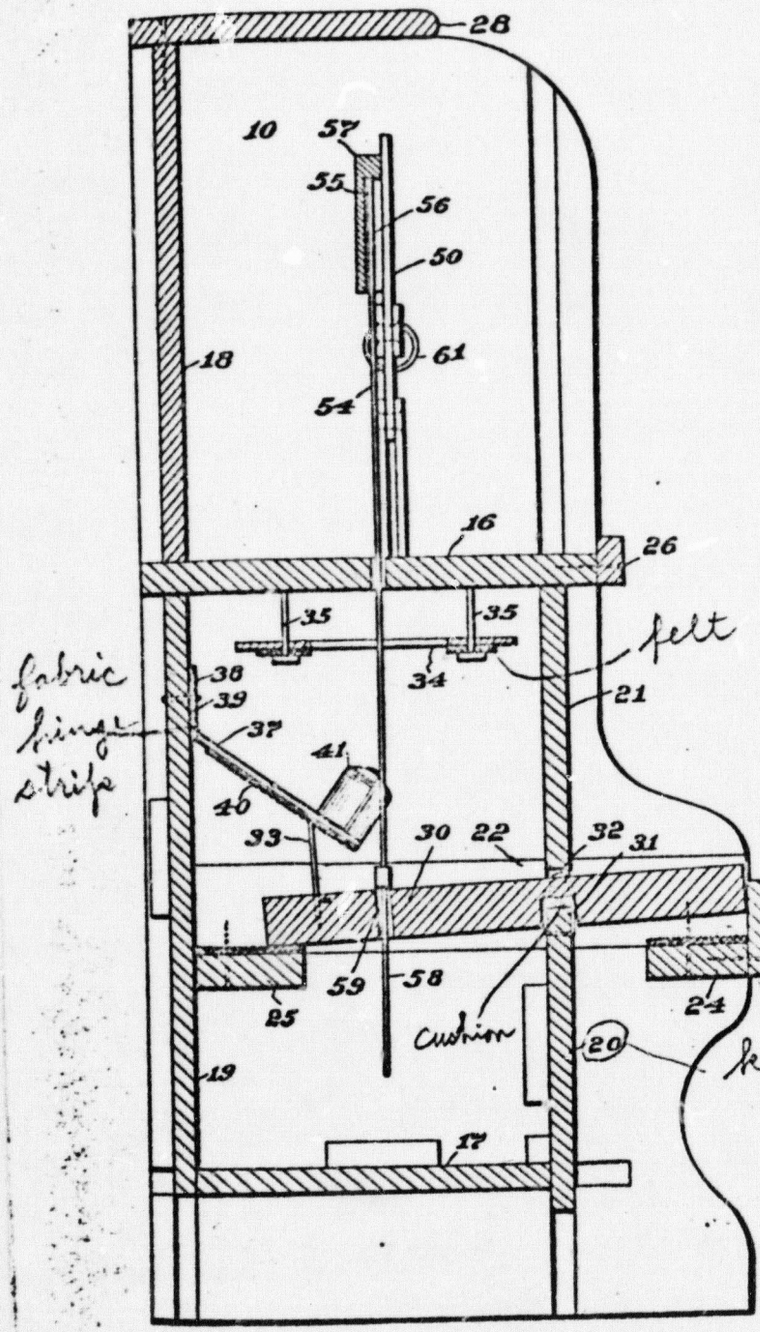

Fig. 2

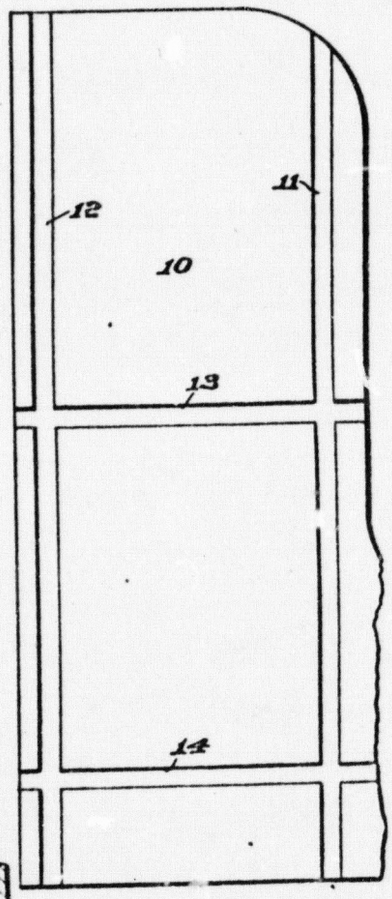

Fig. 3

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Sept. 1, 1936. I. MARKS 2,052,890

TOY PIANO

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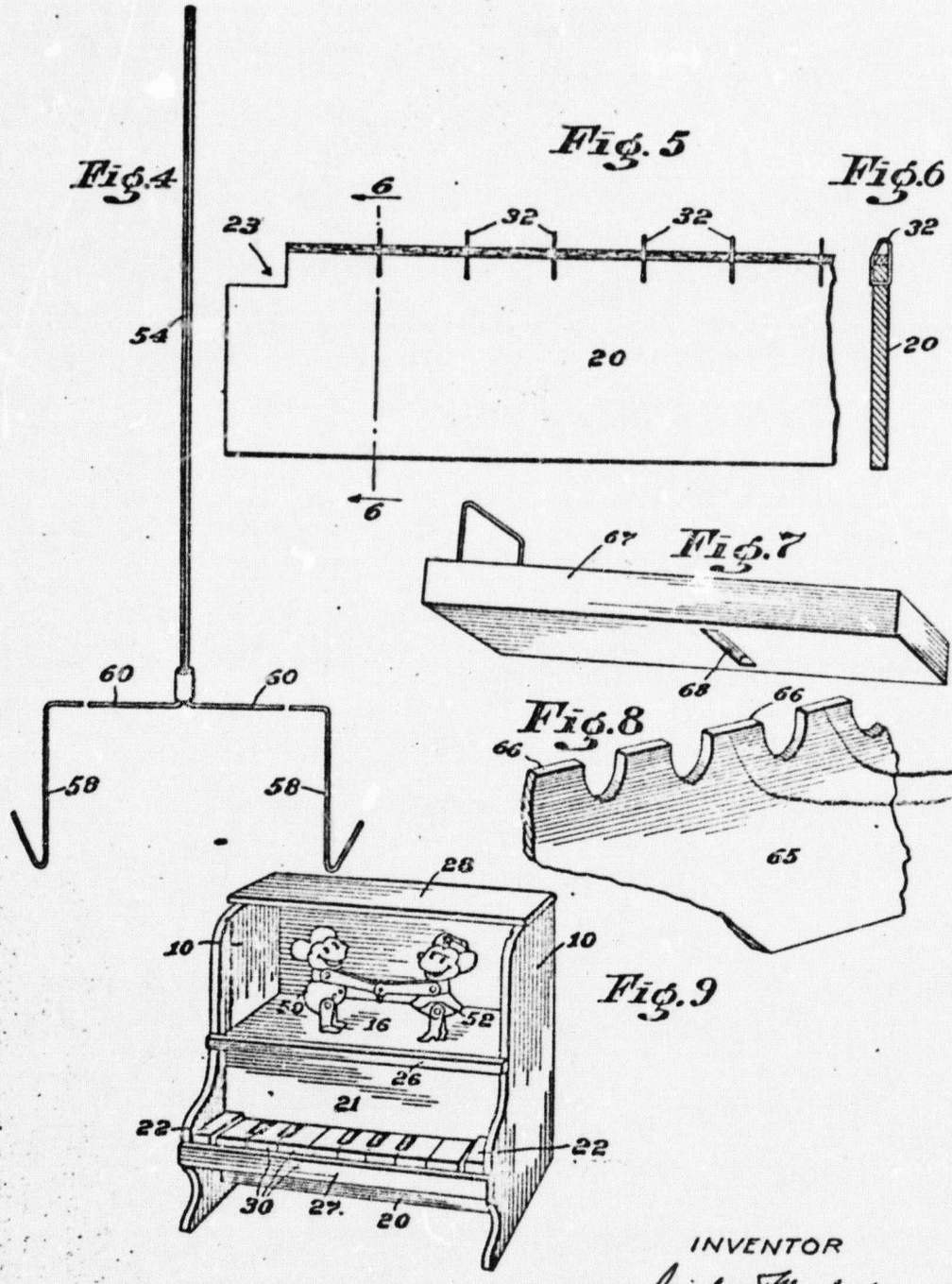

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Patented Sept. 1, 1936

2,052,890

UNITED STATES PATENT OFFICE

2,052,890

TOY PIANO

Isidore Marks, Boston, Mass.

Application October 18, 1935, Serial No. 45,565

12 Claims. (Cl. 46—118)

This invention relates to mechanical toys of the kind having an animated figure or figures which simulate dancing on operating the toy. The invention is embodied herein in a toy piano provided with a dancing floor having figures apparently standing thereon which become animated and dance upon the floor when the piano is played.

The objects of the invention are to insure a continuous movement of the dancing figures while playing the piano through actuation from all of the keys of the keyboard with free action of the articulated parts of the dancing figures; to so mount a pair of dancing figures that they cannot rotate or turn their backs to the piano player; and to so simplify the construction of toys of this character that they may readily be assembled by the unskilled labor employed in toy factories.

To the accomplishment of these objects and such others as may hereinafter appear, as will readily be understood by those skilled in the art, the invention comprises the features and combinations of parts hereinafter described and then particularly pointed out in the appended claims.

In the embodiment of the invention illustrated in the drawings:

Figure 1 is a view of a toy piano, in transverse section, in which the improvement of this invention has been incorporated;

Fig. 2 is a view, in fore and aft section, on the line 2—2 of the toy piano shown in Fig. 1;

Fig. 3 gives an inside view of an end board of the toy piano showing how it is cross-grooved to facilitate assembly;

Fig. 4 is a detail view of the support for a dancing figure;

Figs. 5 and 6 are front and sectional views, respectively, of the key-board support for the piano keys;

Fig. 7 is a view, in underside perspective, of a piano key having a modified form of notch;

Fig. 8 is a view, in perspective, of a portion of a modified form of spacer bar for supporting notched keys as shown by Fig. 7; and

Fig. 9 is a view, in perspective and on a smaller scale, of the toy piano as it appears after assembly.

Describing the illustrated toy piano as one practical embodiment of the invention the piano case comprises two end boards 10 each provided at its inner face with a front vertical groove 11, a rear vertical groove 12, an upper horizontal groove 13 and a lower horizontal groove 14, all of which are continuous from edge to edge of the end board (Fig. 3). A floor board 16 for the dancing figures has its ends seated in the two upper grooves 13 and a bottom board 17 is similarly seated in the two lower grooves 14 thus spacing the end boards 10 apart. The spacing may be such that the key-board of the piano consists of one octave or eight keys, as shown, or there may be two or more octaves, the length of the key-board depending on the size of the piano. The back comprises two boards set in the rear grooves 12, one, 18, above the dancing floor and one, 19, below it. The front also comprises two boards set in the front grooves 11, one 20, which serves as a key supporting and spacing bar (Figs. 5 and 6) below the key-board and one 21, above the key-board. A fore and aft bracer 22 is secured to each end board intermediate the horizontal grooves 13 and 14, passing through cut-out corners 23 (Fig. 5) of the spacer bar, and serving to support a front felted mute 24 for the forward ends of the piano keys and a rear felted mute 25 for the rear ends of the piano keys (Fig. 2). Trim strips 26 and 27 are placed across the front edge of the dancing floor and the front mute, respectively. A top board 28 forms a sort of stage for the dancing figures.

Proceeding now to a description of the piano action and its effect upon the figures on the dancing floor before describing novel method of assembling the various parts, the key-board as herein shown for convenience of delineation comprises eight keys 30 which may be painted to simulate sharps and flats even though the notes produced sound but a single octave. Each key has an under notch 31 (Fig. 2), conveniently a cross groove by which it may be pivotally seated on the cushioned top edge of the spacer bar 20. The spacer bar (Fig. 6) carries a series of spaced wire clips 32 clenched into the bar thus insuring separation of the keys, preventing rubbing and preserving their individual action. The notches 31 are somewhat forward of center so that the keys normally assume a tilted position with their rear ends resting on the rear mute 25 (Fig. 2). Each key carries a wire loop 33 at its rear end which engages the cushioned under side of a movable hammer that may be thrown upward by the key action to engage one of a series of xylophone plates to sound the notes.

The xylophone plates 34 may conveniently be strung in a row, each on two headed nails 35 driven into the lower face of the dancing floor 16, strips of felt or the like being threaded on the nails and lying beneath the plates to mute the

notes as they fall back after being struck and lifted by the hammers.

The eight note strikers are conveniently secured as a single unit to the lower back board 19. To accomplish this a piece of relatively strong fabric is cut with eight tab- 37 depending from a top strip 38 which may be folded over a reinforcement 39 for strength and is secured, as by stapling, to the back board. Each tab is provided with a stiffener 40 and its under face and the stiffener is felted for silence. At its free end each tab carries a wood hammer 41 which may have a nail for striking a note-plate 3? located above it and in its path of movement. The hammers move individually upon the strip 38 as a hinge when actuated by an upward movement of the rear end of a co-acting piano key.

It will be observed that the construction just described provides for a preliminary assembly of the strikers and back board and of the xylophone plates and dancing floor thus permitting these otherwise loose parts to be handled as a unit as the piano is being built. These preliminary assemblages also facilitate placing the keys as a unit in co-acting position as will appear later.

Referring now to the animated figure and to the manner in which it is actuated to simulate dancing when the piano is played, the figure or, as illustrated, the figures 50 and 52 may be made of cardboard, colored to represent a well known cartoon subject if desired, and having the arms and legs loosely pivoted to the body. In the present instance two dancing figures are shown each mounted loosely on the upper end of a reciprocatory rod 54 passed upward through a hole in the dancing floor 16. The back of each figure carries a block 55 (Fig. 2) conveniently grooved at its inner face. This groove 56 has an open bottom for receiving the rod 54 and has a closed top 57 so that the figure is suspended on the end of the rod and will be thrown upward when the rod rises and settle back thereon when the rod rescends.

The rod 54 is reciprocated, and the figure suspended thereon thus animated, by movement of the piano keys. The rod 54 is conveniently formed of a pair of wires soldered at the upper end, or a single doubled wire (Fig. 4) which may be soldered at the upper end. The two strands are branched laterally at their lower ends forming an inverted T, finally terminating in two spaced legs 58. An eyelet may be placed at the branch if desired to prevent spreading. The spacing of the legs 58 may be any desired distance but with an eight-key key-board and two dancing figures it is appropriate to animate each figure from any one of four keys. Accordingly as illustrated, the legs 58 are so spaced as to pass downward through enlarged holes 59 in the first and fourth key for one leg and in the fifth and eighth key for the other leg. As a safety device each leg 58 may be hooked at its lower end as shown in Fig. 4 said hook yielding as it is forced down through the hole in a key and then springing outward again. When the piano is not being played the lateral branches 60 (Fig. 1) of each figure-supporting rod, as illustrated, lie above and rest upon the rear portions of four adjacent keys. Playing any one of these four notes will cause said rod to reciprocate, throwing the figure upward and permitting it to drop back thus jiggling its arms and legs. A sharp striking of a key might throw the figure off of the rod but the proportionate size of the figure to the height of the "stage" purposely is such that the figure's head will strike the top board 28 before the figure can leave its supporting rod. With the construction shown both figures will dance continually while the piano is being played.

The loose mounting would permit a figure to rotate on the rod 54 unless constrained. In order to ensure that the two figures are continually forwardly-facing a connecting ring 61 is passed through holes in the four hands of the two figures thus preventing either figure from rotating relatively to the other.

Figs. 7 and 8 illustrate a modified, but a simpler and thus probably a preferable, form of key mounting. In this instance the key supporting and spacing bar 65 is provided with a heavy saw-tooth formation at its upper edge, each comparatively wide tooth 66 forming a support for a single key 67. Each such key has a notch 68 in its under face corresponding to the notch 31 (Fig. 2) but of less length than the width of the key and otherwise of such dimensions as to fit a little loosely over the squared end of a tooth 66. Engagement of the side walls of a tooth with the end walls of a notch 68 positively prevents lateral displacement of any key and the spacing of the teeth is such that each key has free individual action. This form of key mounting eliminates key spacing elements and it is not essential to use a soft packing on the edge of the key support. The front board 21 (Fig. 9) holds the entire key-board down.

The various parts of the piano action are purposely designed for ease of assembly by unskilled labor. In the toy factory the strikers are preliminarily fastened to the back board 19 and xylophone plates to the dancing floor 16 thus facilitating their assembly. The end boards having been spaced by the connected fore-and-aft bracers 22, the key-supporting bar 29 may then be slipped into the spaced end board grooves 11 below said bracers. Each figure supporting wire carrying the two perforated keys is threaded through its appropriate hole in the dancing floor 16 and the floor is then slipped into the end board grooves 13 and pushed well back while all the keys are fitted on the spacer bar and the front board 21 is slipped in the end board grooves 11. Sliding the dancing floor well forward the back board 19 may be slipped into the end board grooves 12, tilting the assembly at this time so that the strikers will seat upon the key loops 31. The dancing floor being re-centered, the bottom and back boards 17 and 18 may be slipped into and secured in their grooves, the figures placed on the wires, and finally the top board 28 and trims secured in place. It will be understood that the felts are all secured on their respective supports prior to assembly. The principal securement is by glue and cleats as in the manufacture of furniture. Thus a simple mode of assembly by slipping the parts into prepared guides is provided for a toy having a piano action.

Having described the nature of the invention in its preferred form but recognizing that changes may be made in the structure and its mode of assembly may be varied, the described embodiment is intended as an exploitation of the underlying essentials of the invention the true scope of which will be found in the claims herewith.

What is claimed as new, is:—

1. In a toy piano of the type described having a figure mounted above the key-board on a movable means and animated by a movement of said means on playing the piano, characterized by the

fact that said movable means is associated with and actuated by any one of a plurality of the piano keys.

2. The construction according to claim 1 in which said movable figure supporting means consists of a reciprocatory rod having a lower part extending laterally, and contacting the upper rear portions of said plurality of the piano keys.

3. In a toy piano of the type described having a figure above the key-board and reciprocatory means intermediate said figure and the key-board serving, on playing the piano, to jiggle the figure and simulate dancing, characterized by a socket carried by said figure, and said reciprocatory means comprising a rod the upper end of which enters said socket loosely and the lower end of which is branched to contact several keys, whereby said rod is reciprocated to jiggle said figure by the movement of any one of a plurality of keys.

4. In a toy piano of the type described having a dancing figure above the key-board mounted on a rod adapted to be reciprocated on playing the piano, said rod having the form of an inverted T the figure supporting stem of which consists of two strands of wire, the lower ends of said strands branching laterally in opposite directions and overlying certain piano keys and the upper ends thereof being connected.

5. The construction according to claim 4 characterized by the fact that said T-rod is formed from a single piece of wire bent upon itself to form its two strand stem.

6. The construction according to claim 4 characterized by the fact that said T-rod is provided with a leg depending from each lateral branch having a hook at its lower end.

7. A toy piano having, in combination, a key-board, two dancing figures above the key-board each having a body with jointed arms and legs, each figure being mounted loosely on the upper end of a rod, both rods passing downward and each associated with certain of the piano keys to be reciprocated by rocking said keys, said figures facing each other with arms extended and said extended arms being connected, thereby preventing a rotation of either figure as it jiggles on its supporting rod when the piano is played.

8. In a toy piano of the type described having a stage above the key-board, a rod adapted to be reciprocated on playing the piano and passing upward through the stage and a figure on said stage supported by the rod, characterized by a key-board including at least one octave having two non-adjacent perforated keys, the lower end of said rod being branched laterally in opposite directions, each branch having a leg and said legs passing downward each through one of said perforated keys, whereby said lateral branches will overlie both said perforated and the intervening keys.

9. The construction according to claim 8 characterized by a plurality of said branched rods with a figure supported on each, and the branches of each rod overlying a portion of the keys but together overlying the entire key-board.

10. The construction according to claim 8 characterized by two branched rods with a figure supported on each, the branches of each rod overlying one half of the keys of the key-board, some of the members of said figures extending toward each other and such members being secured together.

11. In a toy piano of the type described having a stage above the key-board, a rod passing upward through the stage and associated with one or more of the keys for reciprocation thereby when the piano is played and a figure on said stage supported by the rod, said support for the figure consisting of a socket on the figure having an open lower end and closed upper end for receiving the upper end of the rod and loosely suspending the figure thereon, permitting the figure to move up and down on the rod as the rod reciprocates during the playing of the piano.

12. The construction according to claim 11 characterized by a cover above the dancing floor at a height above the figure such that upward movement of the figure on the rod will be terminated by the figure hitting said cover before said socket can leave the rod.

ISIDORE MARKS.

April 7, 1942. R. J. LOHR 2,279,143

TOY PIANO

Filed Aug. 15, 1939

Fig. 1.

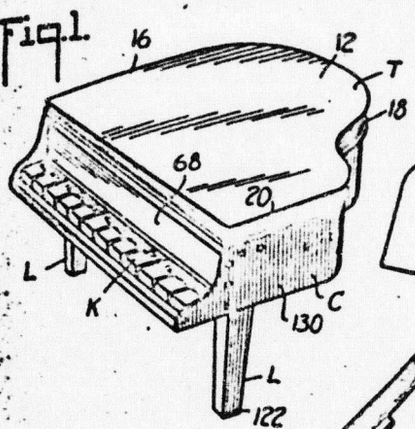

Fig. 2.

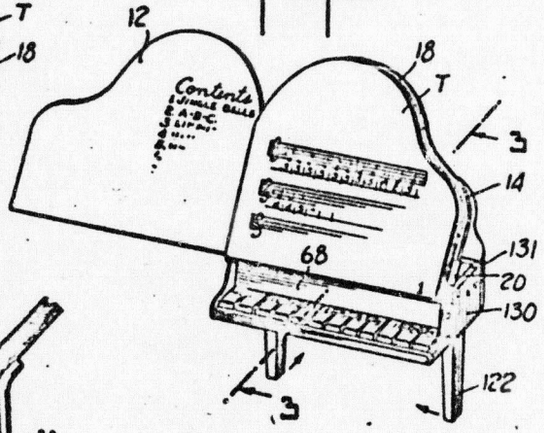

Fig. 3.

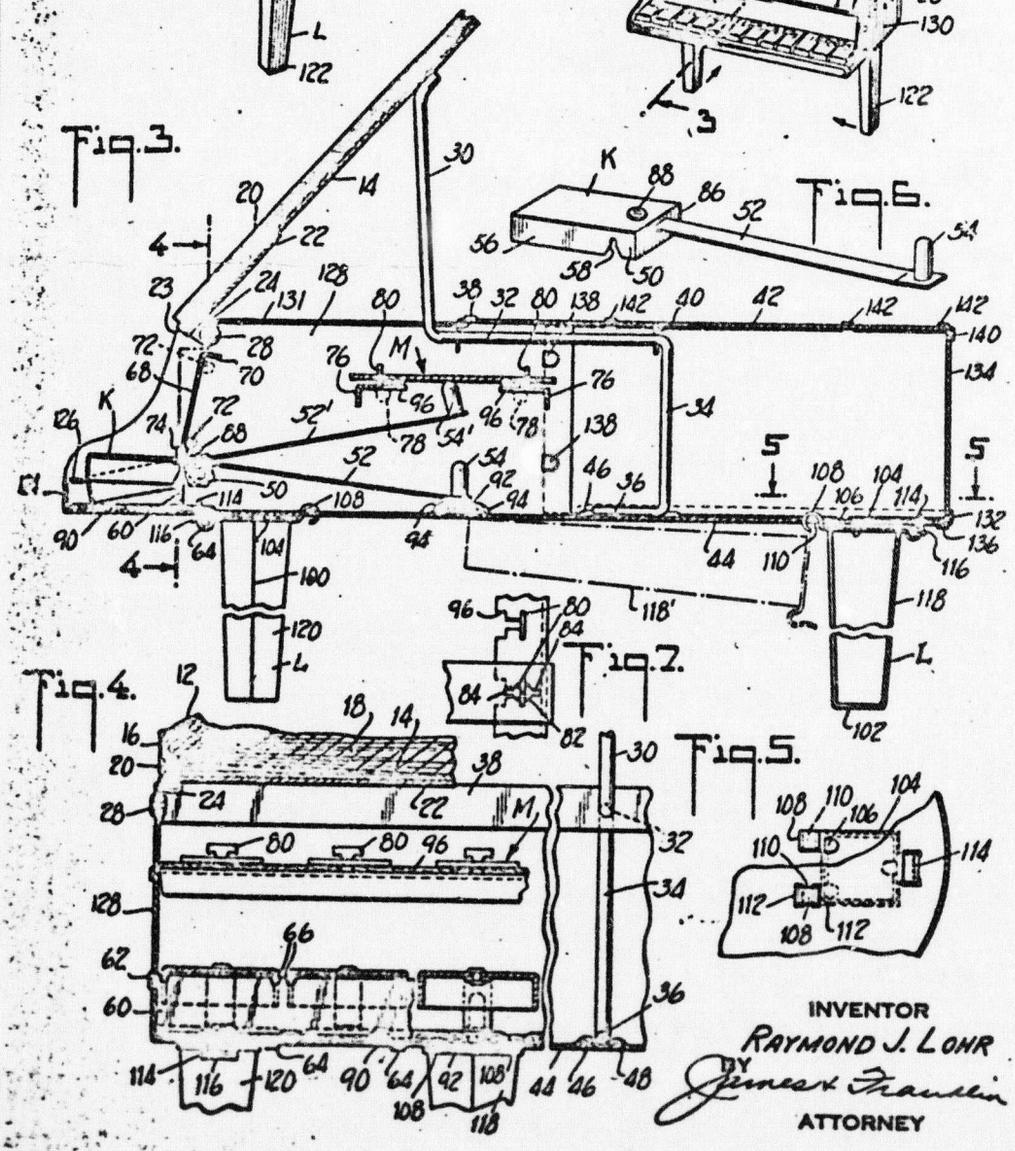

Fig. 6.

Fig. 7.

Fig. 4.

Fig. 5.

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ATTORNEY

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IN THE UNITED STATES DISTRICT COURT

SOUTHERN DISTRICT OF NEW YORK

GEORGE LERNER, JULIUS ELLMAN, Plaintiffs,	
v.	Civil Action 73 CIV 2006
CHILD GUIDANCE PRODUCTS, INC. QUESTOR CORPORATION, Defendants.	W.C.C.

DEFENDANTS' PRIOR ART BOOK

Table of Contents

Tab	U.S. Patent No.	Inventor	Date
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BEST AVAILABLE COPY

A. YOUNG.

Improvement in Musical Instruments.

No. 123,969. Patented Feb. 20, 1872.

Fig. 1.

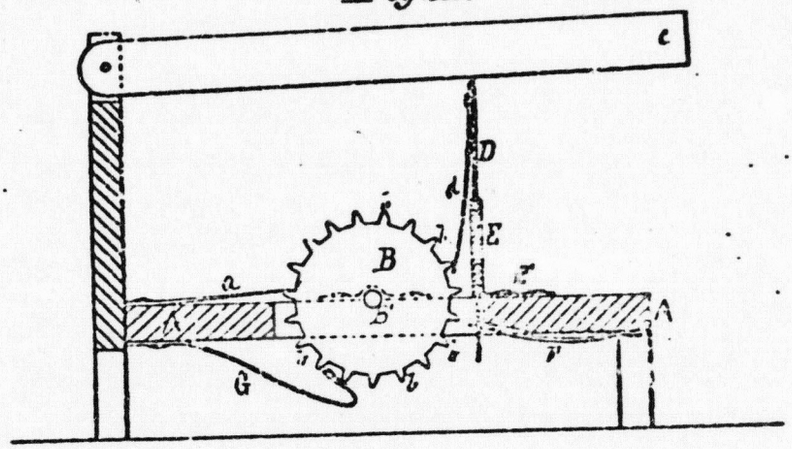
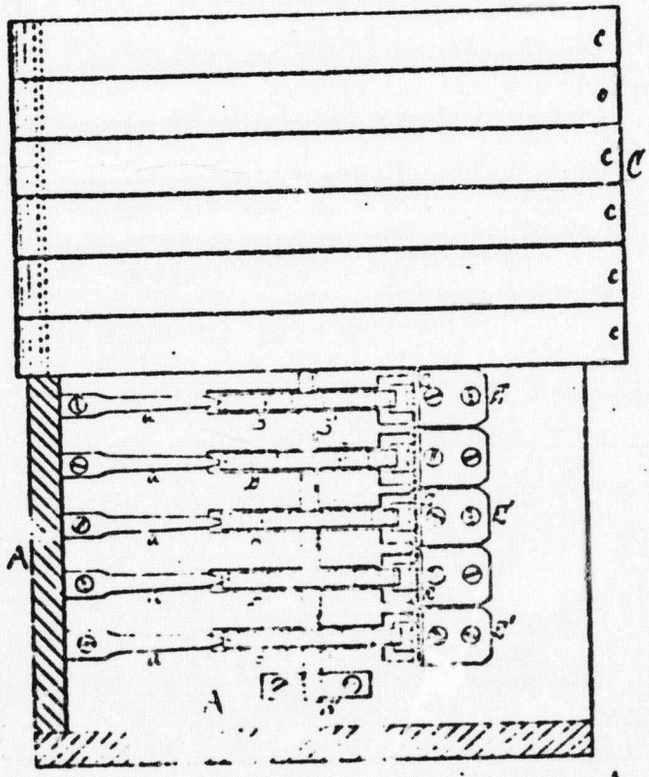


Fig. 2.



Witnesses

Inventor
A. Young.
per J. Bonneau
Attorney

UNITED STATES PATENT OFFICE.

AUGUSTUS YOUNG, OF NORFOLK, VIRGINIA.

IMPROVEMENT IN MUSICAL INSTRUMENTS.

Specification forming part of Letters Patent No. 123,069, dated February 20, 1872.

To all whom it may concern:

Be it known that I, AUGUSTUS YOUNG, of the city and county of Norfolk and State of Virginia, have invented certain new and useful Improvements in Musical Instruments, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing and to the letters of reference marked thereon making part of this specification, in which—

Figure 1 is a vertical sectional view of my improvement. Fig. 2 is a top-plan view, part of the keys being removed.

The object of my present invention is to furnish an improved musical instrument which shall combine and blend all the advantages of the piano-forte as to the endless variety of its performance and the musical box as to sweetness and accuracy of execution. In my improvement the spring-steel bars that produce the musical sounds are arranged in a sounding-box parallel to each other and in octaves in a manner very similar to the arrangement met with in the ordinary musical box; but, instead of these spring-bars being operated upon mechanically through the action and revolution of a chime barrel or drum, each bar is provided with an independent serrated or toothed disk, and each disk is moved through a spring attachment, hereinafter described, and which is connected with the key-board of the instrument, and which key-board is in every respect the fac-simile of that now used in the piano-forte. Thus, while I secure all the richness and softness of note and expression of the musical box, owing to the fact that each spring-bar represents a distinctive note, and is so arranged as to be sounded by its respective key and none other, and the functions of the different keys being as independent as are those of the piano-forte, it will readily be seen that any music arranged for the piano can be performed without the slightest alteration on my improved instrument.

The construction and operation of my invention are as follows: A is the sounding-board or box of the instrument, which is constructed in the usual manner, and is arranged and secured on any suitable frame-work—such, for instance, as the style of the piano-forte's. *a a* are a series of steel spring-bars, which are arranged on and attached to the sounding-board or box A exactly as in the musical box, and on the identical principle of the same. Each bar *a* represents a distinctive note, also as in the musical box. The number of bars employed, of course, varies, but is always controlled by the number of octaves of the key-board. As in the piano-forte each key acts on its respective string, so in my improvement each key has its respective musical bar. B B are a series of serrated disks or toothed wheels, and are secured by suitable bearings to a stationary axle-shaft. B', which is journaled to the sounding-board or frame A, as clearly shown in Fig. 2. This axle B' is secured at such relative position to the bars *a a* that the teeth *b b* alone, when the wheels B B are revolved, come in contact with the bars. C is the key-board, and is in every respect constructed precisely as is the key-board of the ordinary organ and piano. Instead, however, of the keys *c c* being at their front section pivoted on vertical rods or other equivalent supports, as in the key-board referred to, in my improvement they rest on sliding bars or plates D D, as clearly shown in Fig. 1. These sliding bars or plates D D are constructed of any suitable material, and are secured and travel in slotted vertical standards E E, which are permanently secured by bearing-plates E' E' to the board A. *d d* are spring fingers or pawls, one of which is permanently attached to each of the sliding bars D, and secured at such an angle as to leave its free end in immediate and direct contact with the ratchet-teeth *b b* of one of the wheels or disks B. Each of these sliding bars D D is sustained and supported by an independent spring-plate F, so arranged that when the key is struck it allows of the ready depression of the key, but, so soon as the pressure is removed, returns the bar D and its finger *d* to their normal position. G is a retaining-pawl, and regulates the motion and prevents a return movement of the wheel B. The pawls *d* and G are rendered noiseless by being covered with sheep-skin.

From the foregoing distinct and detailed description of the mechanism employed in its construction, the operation of my improvement will be readily understood.

The musical spring-bars *a a* and the shaft B', having a series of toothed wheels, B B, attached, are all arranged so as to leave the teeth

b b of one of the wheels in such contact with its bar *a* as to cause it to be acted upon each time the wheel is moved precisely as in the piano-forte action. Whenever any hammer is moved through the action of its key, it strikes its respective string. The instrument is played on exactly like the piano. You strike one or more of the keys *c c*, and each depresses its sliding bar D, which, through its spring-pawl *d*, turns the wheel B so as to cause one of its teeth *b* to elevate the bar with which it is in contact, so as to cause its vibration and the emitting of the sound of its distinctive note, the brake-pawls G G resting on the teeth *b b* regulating the movement of the wheels B B, and preventing their return, as clearly shown in Fig. 1. The moment the pressure of the finger is removed from the key *c*, and through which the sliding bar D has been depressed, the spring F instantly elevates it, returning it and its finger *d* to their normal condition, and the key in position again to be played on.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

The spring-bars *a a*, arranged as stated, ratchet-wheels B B, vertical sliding bars D D having spring-pawls *d d* attached, and springs F G, the whole being so combined and arranged, in connection with an ordinary key-board, that as each key is struck its sliding bar shall act directly on the ratchet so as to cause the ratchet-wheel to vibrate its respective bar without the aid of a drum or other intermediate mechanism, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

AUGUSTUS YOUNG.

Witnesses:
JOHN N. DEWELL,
G. F. DUTTEN.

A. SCHOENHUT.

Musical Instruments.

No. 137,243. Patented March 25, 1873.

FIG. 1.

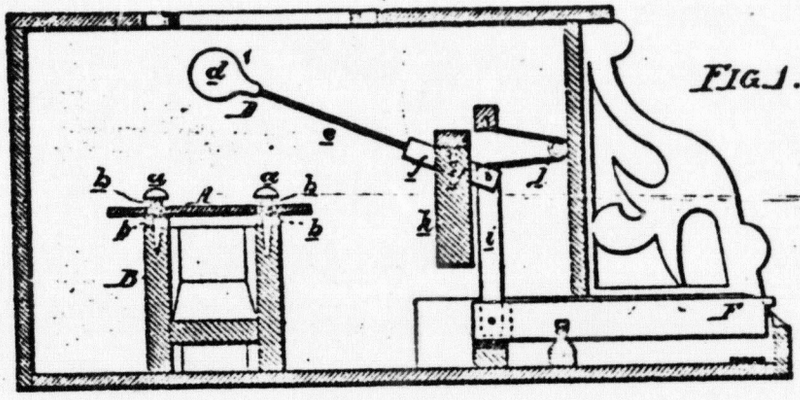
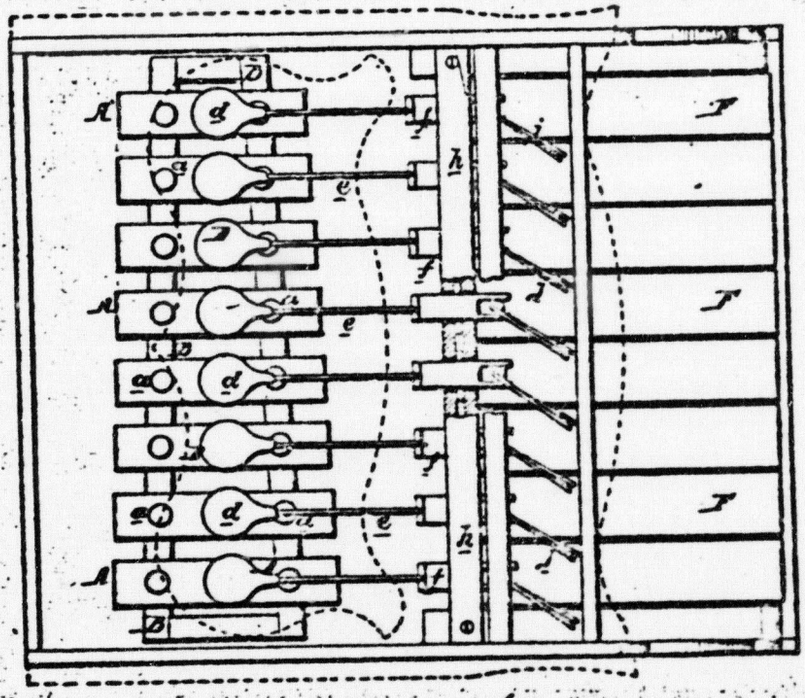


FIG. 2.



WITNESSES { John K. Ruperlus
Harry Smith

Albert Schoenhut
By his Attys.
Howson & Sons

UNITED STATES PATENT OFFICE.

ALBERT SCHOENHUT, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN MUSICAL INSTRUMENTS.

Specification forming part of Letters Patent No. 137,213, dated March 25, 1873.

To all whom it may concern:

Be it known that I, ALBERT SCHOENHUT, of Philadelphia, Pennsylvania, have invented an Improved Musical Instrument, of which the following is a specification:

My invention relates to improvements in musical instruments in which the sounds are produced by suspended plates struck by hammers; and the object of my invention is to simplify the operating parts and insure the production of clear and distinct sounds.

I accomplish this object by combining, in the manner shown in the sectional view, Figure 1, and plan view, Fig. 2, of the accompanying drawing, a series of flat metal plates, A, of different lengths, arranged side by side upon a frame or sounding-box, B; a series of hammers, D, for striking the said plates; and a series of keys, F, for operating the said hammers.

The metal plates A consist, in the present instance, of simple flat strips of hoop iron, cut to different lengths, so that each, when struck, shall produce the tone desired; and in order that this tone shall be full and rich the said plates are caused to rest upon a sounding-box, B, from which each is isolated, as well as from the pins *a* which retain it in position upon the said box, by means of wool or other suitable substance *b* inserted beneath the plates and wrapped around the retaining-pins, as best observed in Fig. 1. This permits the free vibration of the plates when they are struck by the hammers, and prevents the interfering vibrations resulting from suspending all the plates on cords, as usual, and the weakening of the sound which would be caused by contact of the said plates with metal or other unyielding substance. The arrangement of the hammers D above the plates A, as shown in the drawing, enables the sounding-box B to be employed without interfering with the operation of the said hammers, and without unduly increasing the height of the case. Each of the latter consists of a head, *d*, a shank, *e*, and butt *f*, the latter being pivoted at *g* to the hammer-rail *h*, and connected by a rod, *i*, to the key F, a spring, *j*, acting constantly upon the connecting-rod *i* or hammer-butt, and tending to maintain the said hammer and key in the elevated position shown in Fig. 1, and to restore them to this position after sounding a note.

If a hammer be lowered slowly by depressing its key it will not quite reach or strike its plate A; but, as the shank *e* of the hammer is made of spring-wire, or of other equivalent material having an inherent elasticity, if the said hammer be suddenly depressed, as usual in playing, by striking its key, the momentum will be sufficient to cause the head of the elastic hammer to strike the plate and produce the desired sound, and to then immediately recoil before the hand is lifted from the key. This elasticity of the hammer allows of the use of positive connections with the keys and hammers, so that the usual expensive and complicated tripping mechanism may be dispensed with.

Claims.

1. The arrangement of the plates A upon a sounding-box, B, beneath the hammers D, as and for the purpose set forth.

2. The combination of the slotted plates A, sounding box B, its pins *a*, and the isolating material arranged between the box and plates, as and for the purpose described.

3. The combination of the keys F and hammers D having elastic shanks and connected positively with the keys, as and for the purpose specified.

4. The hammers D and keys F, in combination with the connecting-rods *i* and springs *j*, for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALBERT SCHOENHUT.

Witnesses:
WM. A. STEEL,
HERBERT HOWSON.

404

(3) DRAFTSMAN.

No. 658,284. Patented Sept. 18, 1900.

A. SCHOENHUT.

TOY PIANO.

(Application filed Aug. 11, 1900.)

(No Model.)

Fig. 1.

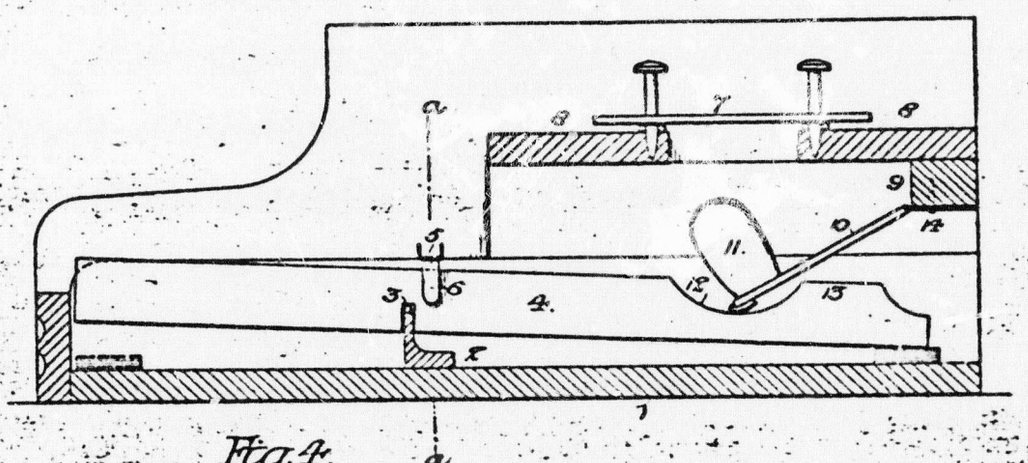


Fig. 4.

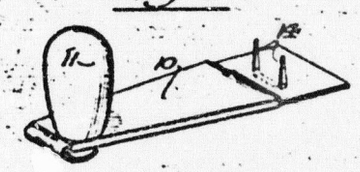


Fig. 2.

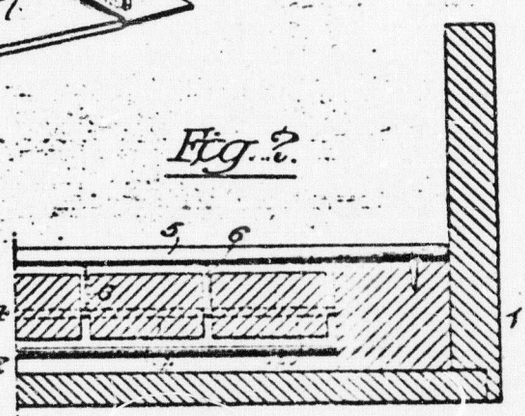
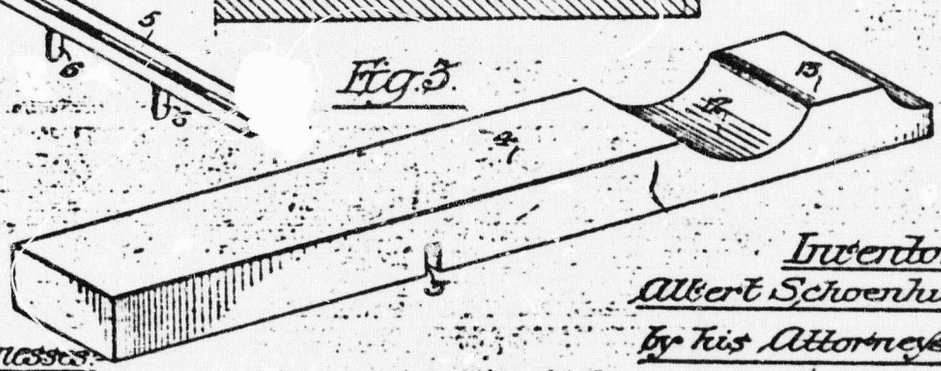


Fig. 5.

Fig. 3.



Witnesses:
J. E. Beckstedt
Louis H. Whitehead.

Inventor:
Albert Schoenhut
by his Attorneys
Fenwick & Hopkins

BEST COPY AVAILABLE

UNITED STATES PATENT OFFICE.

ALBERT SCHOENHUT, OF PHILADELPHIA, PENNSYLVANIA.

TOY PIANO.

SPECIFICATION forming part of Letters Patent No. 658,284, dated September 18, 1900.

Application filed August 11, 1899. Serial No. 726,905. (No model.)

To all whom it may concern:

Be it known that I, ALBERT SCHOENHUT, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Toy Pianos, of which the following is a specification.

My invention consists of certain improvements in the construction of the keys, hammers, and key-separating devices for a toy piano.

The object of my invention is to simplify and improve these parts without adding to the expense of the same. This object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a transverse section of sufficient of a toy piano to illustrate my invention. Fig. 2 is a longitudinal section on the line *a a*, Fig. 1. Fig. 3 is a perspective view of one of the keys. Fig. 4 is a perspective view of one of the hammers, and Fig. 5 is a perspective view of a portion of the separating-bar.

In Fig. 1 part of the casing of the piano is represented at 1, the bottom of this casing having the longitudinal bar 2, whose upper edge is adapted to vertical slots 3 in the lower portions of the keys 4, the latter being mounted side by side on said bar 2, as usual.

In order to separate adjoining keys, so as to prevent adjoining keys from coming into contact, and thereby interfering with the proper and easy manipulation, I employ a longitudinal bar 5, located above the row of keys and extending from end to end of the row, this bar having a series of depending fingers 6, which project down between adjoining keys of the row and serve to effect the proper separation of the same. In the present instance the bar 5 is in the form of a hollow channel or U-bar, as it can thus be made of light sheet metal and yet will possess the necessary strength and rigidity, and the fingers 6 consist of portions of the web of this bar cut and drawn down, as shown in Figs. 2 and 3, an operation which can be readily performed and which renders unnecessary any means for securing the fingers to the bar.

The metallic tone-plates 7 common to toy pianos are supported upon the usual bar 8, and beneath the latter is a bar 9, on which are secured, by means of suitable fastenings, the stems or shanks 10 of the hammers 11. Each of these hammer-stems consists, preferably, of a strip of pasteboard covered on both sides with muslin or other thin textile material which projects beyond the pasteboard strip at both ends, the inner projecting portion being secured to the bar 9 and serving as a hinge for the hammer, while the outer projecting portion is bent under the end of the hammer-stem and is thus interposed between said stem and the top of the key, so as to act as a cushion for the hammer. The hammer-block 11 is simply glued or otherwise secured upon the top of the outer or free end of the hammer-stem, as shown in Figs. 1 and 4.

In order to provide for compact disposal of parts and yet permit of the desired extended swing of the hammer, a recess 12 is formed in the top of each key for the reception of the free free end of the hammer-stem. Hence when the forward end of the key is depressed an upwardly-projecting portion 13 of the key in the rear of the recess 12 strikes the hammer stem or shank at a point behind the head 11, whereby the desired upward movement of the hammer is effected with but a very light touch upon the forward portion of the key.

For the purpose of securing the flexible tongue at the rear end of the hammer-stem to the bar 9 I prefer to use a double-pointed tack 14, since this not only serves to secure said flexible tongue to the bar 9, but it also prevents any lateral twisting or displacement of the hammer-shank, and thus insures the maintenance of the hammers in proper position one in respect to the other.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The combination of the keys of a toy piano, with a bar extending along the row of keys, and having fingers projecting between adjoining keys, substantially as specified.

2. The combination of the keys of a toy piano, with a bar extending along the row of keys, and having fingers struck up therefrom and projecting between adjoining keys, substantially as specified.

3. The combination of the keys of a toy piano, with a bar extending along the row of keys, and consisting of a web with upturned flanges, said web having fingers struck up

therefrom and projecting between adjoining keys, substantially as specified.

4. The within-described hammer for a toy piano, said hammer having a stem composed of a strip of pasteboard, with textile material secured thereto, said textile material projecting beyond the inner end of the stem so as to form a flexible hinge therefor, and being folded under the outer or free end of the stem so as to provide a cushion for the same, and a hammer-head secured to the outer end of the stem, substantially as specified.

5. The combination in a toy piano, of a series of keys, a pivot for said keys, means for separating the keys, the top of each key being recessed for the reception of the free end of the hammer-stem, metallic tone-plates, a series of hammers pivoted to the frame and arranged to strike the under side of the tone-plates, said hammers arranged to rest in the recesses in the keys and having cushions at the outer or free ends, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALBERT SCHOENHUT.

Witnesses:
WILL. A. BARR,
JOS. H. KLEIN.

MUSIC
404

DRAFTSMAN.

No. 769,129. PATENTED AUG. 30, 1904.

N. H. COLWELL.

TOY PIANO.

APPLICATION FILED APR. 1, 1904.

NO MODEL.

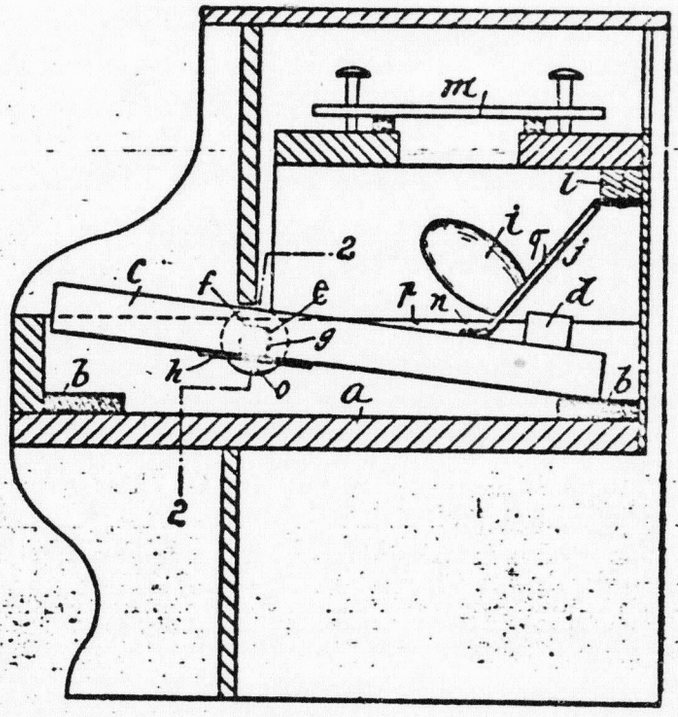


FIG. 1

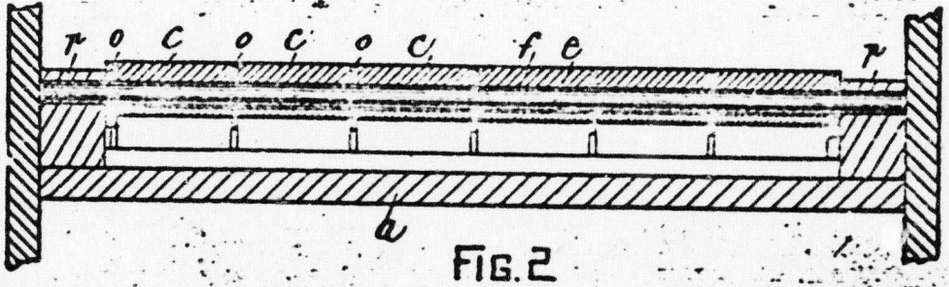


FIG. 2

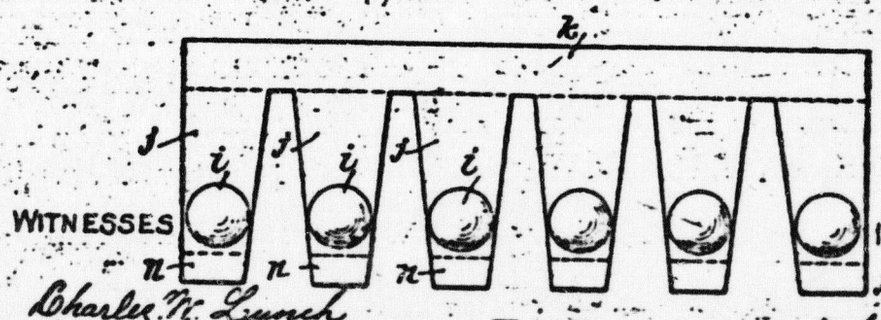


FIG. 3

WITNESSES

Charles W. Lynch

Andrew J. Peterson

INVENTOR

Nicholas H. Colwell

by J. Schofield

ATTORNEY

237

No. 769,129. Patented August 30, 1904.

UNITED STATES PATENT OFFICE.

NICHOLAS H. COLWELL, OF PAWTUCKET, RHODE ISLAND, ASSIGNOR TO NATIONAL NOVELTY CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

TOY PIANO.

SPECIFICATION forming part of Letters Patent No. 769,129, dated August 30, 1904.

Application filed April 1, 1904. Serial No. 201,164. (No model.)

To all whom it may concern:

Be it known that I, NICHOLAS H. COLWELL, a citizen of the United States, residing at Pawtucket, in the State of Rhode Island, have invented a new and useful Improvement in Toy Pianos, of which the following is a specification.

My invention consists of certain improvements in the construction of the keys and of the pivot-support for the same and also of the hammers upon which the keys are arranged to operate, as hereinafter set forth, and by my invention the toy piano is improved both in its construction and operation.

In the accompanying drawings, Figure 1 represents a transverse section of a toy piano embodying my invention. Fig. 2 represents a section taken in the line 2 2 of Fig. 1. Fig. 3 represents an outspread top view of the connected series of hammers.

In the drawings, *a* represents the bottom of the wooden casing of the piano.

b b are strips of felt secured to the bottom *a* to receive the impact of the keys *c c*, which latter are each provided with an attached block *d* for lifting action upon the hammer *i*. The keys *c* are pivoted upon a rod *e*, which may be made of wire or other suitable material, supported at its ends by the wooden strips *p*, the said rod being provided with a non-resonant covering *f*, which may be formed of any suitable material, as a winding of yarn or twine or a covering of braid, cloth, or porous paper. In order to provide at very little expense a suitable opening in the keys *c* for the reception of the rod *e* and its covering *f*, I first saw a groove of sufficient width and depth to receive the pivoting-rod *e* and its covering across a block of wood of sufficient width to make several keys, and then fasten over the groove so formed a strip of paper, pasteboard, or other suitable material, and then saw the grooved block into strips of the required width to form the keys, the resulting groove or notch *g*, covered by the fastened strip *h*, serving to form a proper opening for the reception of the covered supporting-rod *e*, upon which the keys are pivoted for action upon the hammers *i i*.

The shanks *j j* of the hammers *i i* are cut out connectedly from a strip of the proper flexible material, as shown in Fig. 3, and this strip is preferably formed by inserting a strip of pasteboard *q* or similar material between outer layers of cloth and cementing the layers together, and after the wooden hammer-heads *i* have been fastened to the connected shanks *j j*, as shown in Fig. 3, the continuous edge *k* is to be tacked to the wooden strip *l*, so that each of the connected hammers will strike upon its proper metallic tone-plate *m* and rest at the flexible end *n* of its shank upon the upper surface of its operating-key. The keys *c* are kept separate from each other upon the covered supporting-rod *e* by means of the intervening washers *o*, made of pasteboard or other suitable material, which will serve to secure the noiseless action of the keys.

I claim as my invention—

1. The combination of the keys of a toy piano with a pivoting-rod provided with a non-resonant covering, substantially as described.

2. The combination of the pivoting-rod provided with a non-resonant covering with the keys provided with the pivoting grooves or notches covered by the attached strips, substantially as described.

3. In a toy piano, the combination of the series of keys and the series of metallic tone-plates, with the series of hammers having their shanks integrally connected at their inner ends, substantially as described.

NICHOLAS H. COLWELL.

Witnesses:
SOCRATES SCHOLFIELD,
C. E. DAY.

5

404

DRAFTSMAN.

(5)

A. E. JACOBS.

TOY PIANO.

APPLICATION FILED FEB. 20, 1911.

1,151,790. Patented Aug. 31, 1915.

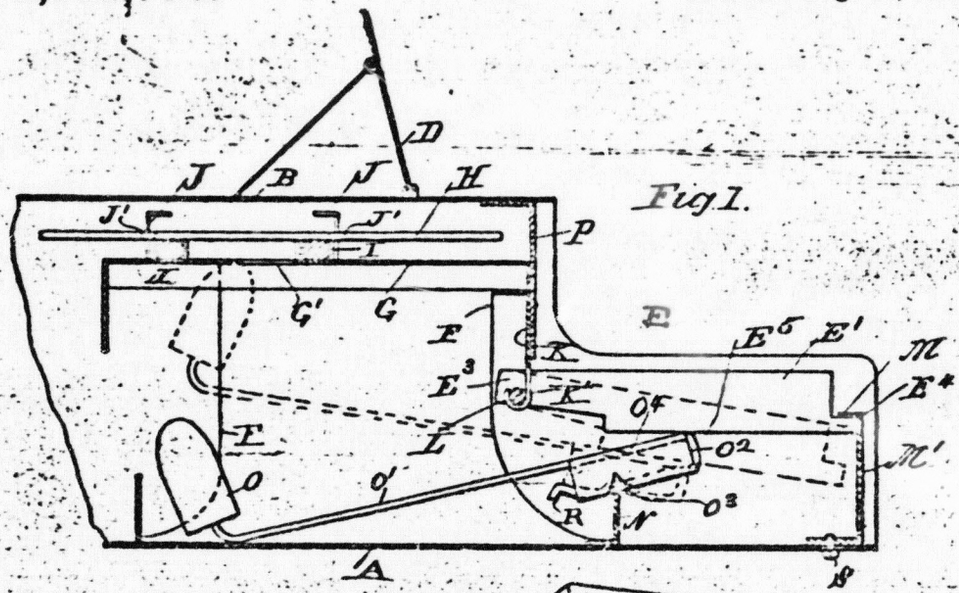


Fig. 1.

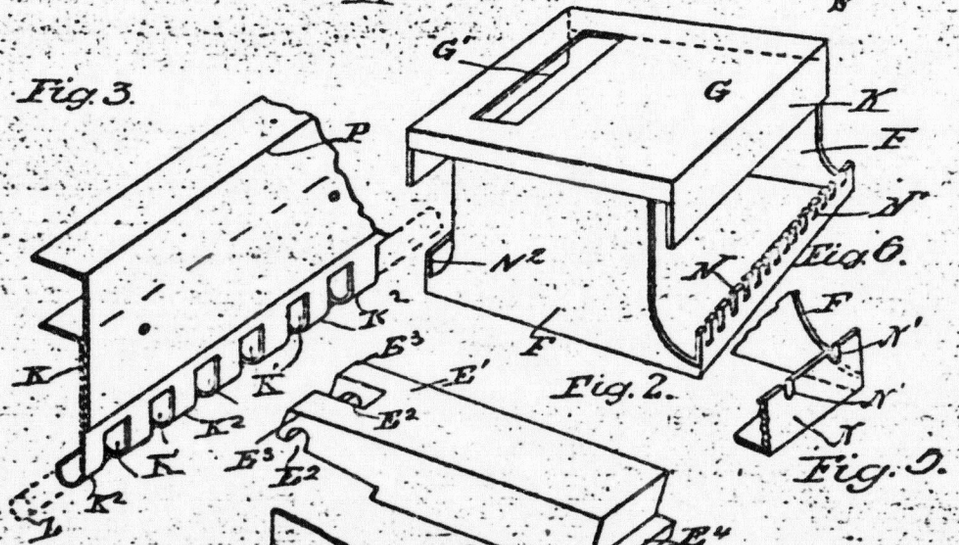


Fig. 3.

Fig. 6.

Fig. 2.

Fig. 5.

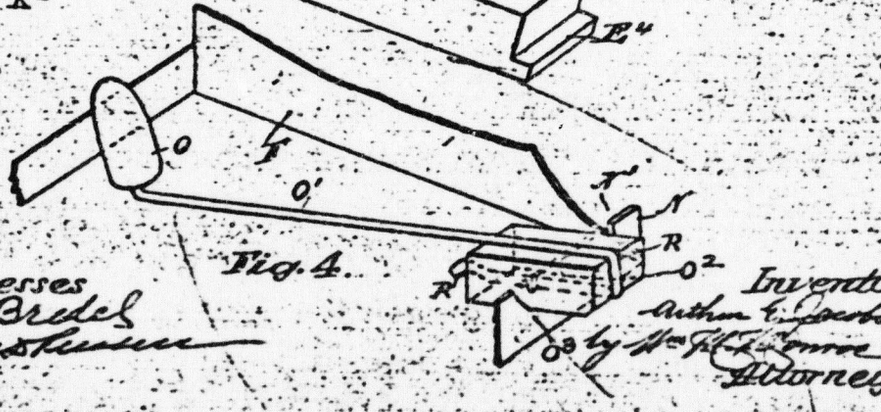


Fig. 4.

Witnesses
P. Bredel
Thos. Kennedy

Inventor
Arthur E. Jacobs
by Wm. H. Lemmon
Attorney

240

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UNITED STATES PATENT OFFICE.

ARTHUR E. JACOBS, OF CLEVELAND, OHIO.

TOY PIANO.

1,151,790. Specification of Letters Patent. Patented Aug. 31, 1915.

Application filed February 20, 1911. Serial No. 609,650.

To all whom it may concern:

Be it known that I, ARTHUR E. JACOBS, a citizen of the United States, and resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Toy Pianos, of which I hereby declare the following to be a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

The objects of the invention are to provide a durable and efficient toy musical instrument of simple construction and designed to produce a singing note of good quality by means of finger keys and hammers in the manner of a piano.

The invention comprises, a hollow metallic case of piano form, a frame slidingly movable therein, metallic tone-producing bars, loosely supported thereon, and spaced from the case, and key-operated striking hammers inclosed within the frame and operated by means of a key board projecting beyond the case, so as to be accessible to the player.

The invention also includes means for preventing the hammers from continuing in contact with the metallic bars after striking them, cushioning means for supporting the bars to prevent contact with the metal frame, and means for pivoting the keys in the frame so that they will remain in place therein. The hammers are also pivoted so that they can not be removed except by removing the frame.

The invention also comprises the combination and arrangement of parts and construction of details hereinafter described, shown in the accompanying drawings and specifically pointed out in the claims.

In the accompanying drawings Figure 1 is a longitudinal central section thereof; Fig. 2 is a perspective view of one of the finger-operated keys; Fig. 3 is a perspective view of a portion of the plate in which the keys are pivoted showing the looped projections at the lower end in which rests the pivot shaft for the keys. Attached to this plate is shown the transverse plate which closes the front opening of the piano frame. Fig. 4 is a perspective view of one of the hammers and a portion of the pivot plate for the hammers, Fig. 5 is a perspective view reduced in size of the inner frame of the piano.

In these views A is a hollow sheet metal case, shaped preferably to appear like a miniature grand piano and provided with openings B for the outlet and distribution of sound, and provided with a folding music rack D, and with a projecting portion E open at the top in which the key board formed of keys E′, E′ is located.

F is a frame in which the mechanism of the piano is secured, so that the parts will stay in position when assembled together, and will endure rough usage without injury. In this frame is secured the elevated horizontal plate G provided with a longitudinal opening G′ over which are secured the metal sound bars H, one for each note, and hence of graduated length.

Each bar rests upon felt or other non resonant supports I, I so as not to communicate vibration to the frame and case, and disturb the quality of the sound. Each bar is secured in place by means of upwardly turned integral tongues J, J which pass through openings J′, J′ in the bar and have turned over tips to prevent the dislodgment of the bar.

The front of the frame is provided with an elevated transversely arranged vertical plate K which is vertically slotted at its lower edge at K′ to form supporting members K^2 which are curved to inclose the pivot shaft L on which the keys E′, E′ rest. Grooves E^2, E^2 form bearings which prevent the keys from being withdrawn, and each key is preferably provided with two projecting parts E^3 which pass through the slots K′. The shaft is put in place after putting in the keys and locks them in position.

The front edge of each key is provided with a projection E^4 which passes underneath a ledge M upon the front plate M′ of the case, and hence the keys cannot be removed although they can work freely on their pivot shaft. Beneath the keys and pivoted upon a vertical plate N are the hammers which are preferably formed with wire stems O′ and wooden heads O. The stems are set in or wound about the hammer butts O^2 which are notched at O^3 and the plate N enters the notch.

The upper edge of the plate N is also preferably notched at N′ for the passage of the lower edge of the loop R of the wire stem and serves to hold the hammers in place, and separates the hammers and in this

manner they are retained in place since the keys rest upon them and hold them down from above.

It will be observed that each key is provided with a straight lower face E^5 which corresponds with the upper face O^4 of the hammer butt O^3 when the key is depressed, as shown in dotted lines in Fig. 2. This face E^4 extends forward of the pivotal point of the hammer so that when the key is depressed and after the first concussion with the sound bar has taken place to produce the sound, the hammer will be withdrawn to the dotted position shown and out of contact with the sound bar, so that no amount of pressure upon the key will make such an engagement possible and hence the vibration of the bar will produce a clear ringing sound which is first obtained by a sharp stroke upon the key and the hammer is instantly withdrawn.

The upper transverse plate P is attached preferably to the frame and plate K and can be withdrawn therewith when the lower plate M' has been removed. The frame can be removably attached to the case, as by means of a screw S or other suitable means. In Fig. 6 the frame is illustrated, detached from the other parts.

Having described the invention what I claim as new and desire to secure by Letters Patent is:

1. In a toy piano, a case, a frame therein, a series of sound bars, supported in an elevated part of said frame, a series of pivoted hammers adapted to engage said bars, a series of pivoted keys adapted to engage said hammers, the engaging surfaces of said keys and hammers passing on both sides of the pivot point of said hammers, and adapted to prevent engagement of the hammers with said bars, after the bars have been struck.

2. In a toy piano, the combination with a series of sound bars and hammers, each including a pivoted block, said block having a flat upper surface, a series of pivoted keys, each provided with a corresponding lower flat surface, the meeting surfaces of each key and block extending on both sides of the pivotal point in each block, and adapted to engage when the key is fully lowered.

3. In a toy piano, a hollow metal case having sound emitting openings, a frame therein, an elevated horizontal plate in said frame, said plate having a longitudinal opening, a series of spaced vertical lugs elevated upon said plate, a series of sound producing bars having openings through which said lugs pass, non-resonant members on said plate on which said bars rest, a vertical lower plate, a series of hammers and supporting members therefor, said members notched for pivotal bearing on said vertical plate, an upper vertical plate at the front of said frame, provided with vertical slots in its lower edge, upwardly turned members between said slots, a shaft resting in said upwardly turned members, and said plate provided with grooves in which said shaft is inserted, projections on the front of said keys, and a retaining plate provided with a rearwardly extending flange passing over said projections.

In testimony whereof, I hereunto set my hand this 14th day of February, 1911.

ARTHUR E. JACOBS.

In presence of—
GEO. S. COLE,
WM. M. MONROE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

U. MUSIC,
410

J. C. DEAGAN.

XYLOPHONE.

APPLICATION FILED OCT. 24, 1917.

1,293,722. Patented Feb. 11, 1919.

Fig. 1.

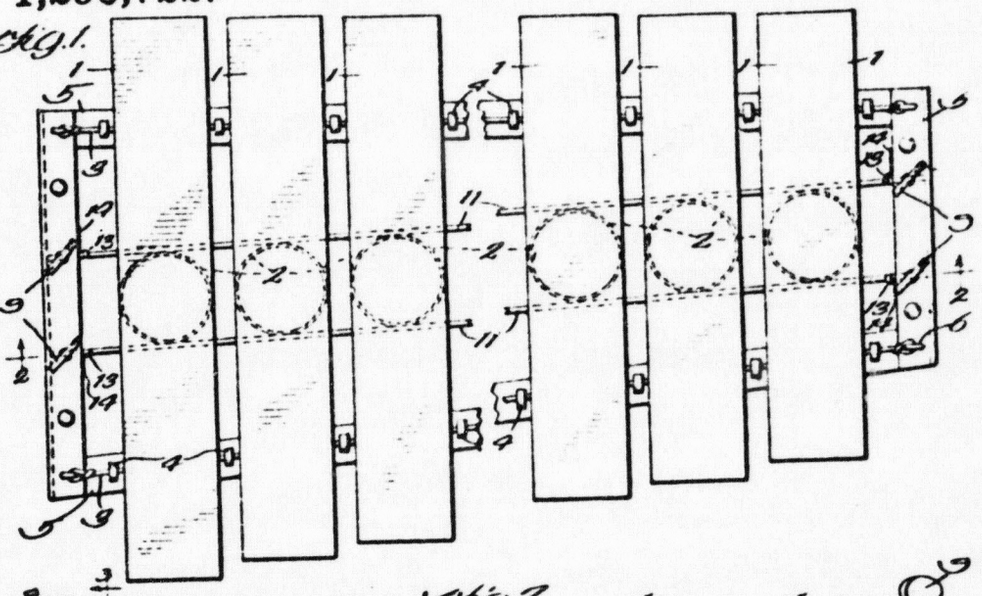


Fig. 2.

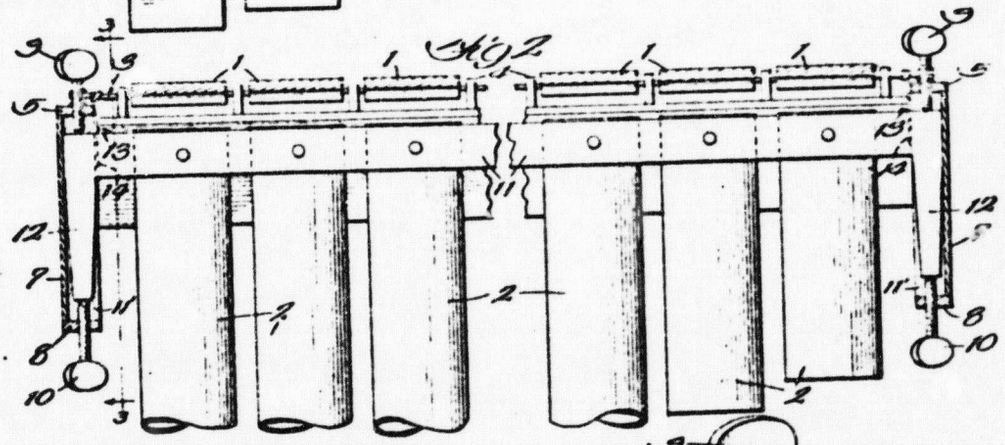


Fig. 3.

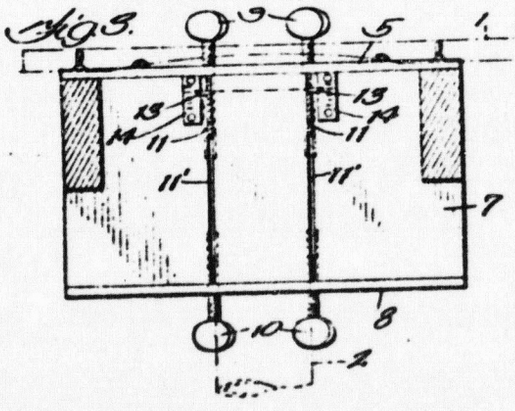
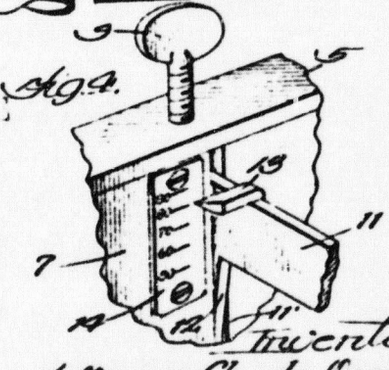


Fig. 4.



Inventor:
Jefferson Claude Deagan
By G. & G. Tully

245
21

84 Music,
410

UNITED STATES PATENT OFFICE.

JEFFERSON CLAUDE DEAGAN, OF CHICAGO, ILLINOIS.

XYLOPHONE.

1,293,722. Specification of Letters Patent. Patented Feb. 11, 1919.

Application filed October 24, 1917. Serial No. 198,271.

To all whom it may concern:

Be it known that I, JEFFERSON CLAUDE DEAGAN, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Xylophones, of which the following is a full, clear, concise, and exact description.

My invention relates to musical instruments employing sound producing bars made of wood or metal or other vibrating material that are tuned to produce tones of a musical scale and resonators below or behind such bars. Such instruments are termed xylophones. An increase in the normal temperature of the bars and resonators will sharpen the pitch of the resonators to bring them out of sympathy or unison with the tones produced by the bars and a decrease from such temperature will flatten the pitch of the resonators. I effect compensation for impairment of the pitch of the resonators due to modifications in temperature by adjustment of the interrelation of the bars and resonators. This adjustment may be effected by simultaneously regulating the distances between the bottoms of the resonators and the bars or the effectiveness of the openings in the resonators that are adjacent the bars.

In the preferred embodiment of the invention the resonators, as a group, are bodily moved toward and from the bars transversely of the bars whereby the bottoms of the resonators are not only adjusted with respect to the bars but the spaces between the tops of the resonators and the bars are also regulated to modify the effectiveness of the openings in the resonators that are adjacent the bars.

I will explain my invention more fully by reference to the accompanying drawing showing the preferred embodiment thereof in which Figure 1 is a plan view showing an instrument of the xylophone type with an intermediate portion broken away; Fig. 2 is a view on line 2—2 of Fig. 1; Fig. 3 is a view on line 3—3 of Fig. 2, a bar and a resonator being shown by dotted lines; and Fig. 4 is a perspective view illustrating a part of the adjusting means.

Like parts are indicated by similar characters of reference throughout the different figures.

The instrument includes sound producing bars 1 each provided with a tubular resonator 2 beneath the same. These resonators are usually open at their upper ends and closed at their lower ends. The bars are so tuned that they will produce tones of a musical scale. They are suitably mounted upon strings 3 that pass through eyes 4 that project upwardly from the side rails of a mounting frame 5. The end rails of the mounting frame carry eyes 6 to which the strings 3 are secured. The mounting frame has depending portions 7 at the ends thereof. Ledges 8 are at the lower ends of the depending portions 7. Adjusting thumb screws 9 project downwardly through the end rails of the mounting frame and are in threaded connection with such end rails. Adjusting thumb screws 10 project upwardly through the ledges 8 of the mounting frame and are in threaded connection with such ledges. Each screw 9 desirably has a screw 10 in vertical alinement therewith. The resonators 2 are disposed between and are in fixed connection with the rails 11 that support the resonators. These rails 11 have downward continuations 12 that rest upon the upper ends of the screws 10, the screws 9 being turned into engagement with the top edges of the rails 11 to prevent the frame from rising.

The spaces between the rails 11 and the end rails of the mounting frame 5 and the spaces between the lower ends of the continuations 12 and the ledges 8 are sufficient to enable a bodily vertical adjustment of the rails and the resonators coupled therewith to simultaneously vary the spaces between the resonators and bars thereby to compensate for the usual wide variations in temperature that the instrument may encounter. The rails enter vertical slots 11' that guide them in their vertical movements.

Let it be assumed that the instrument is adjusted to have the resonators in correct sympathy with the tones produced by the bars in a temperature of 68° Fahrenheit, it being understood that the screws 9 and 10 hold the resonators in such relation to the bars that the desired quantity of tones is producible. If the temperature rises sufficiently from 68° Fahrenheit to throw the resonators appreciably out of sympathy with the tones produced by the bars the resonators are bodily raised to put the resonators into correct sympathy with the tones produced by the bars and if there is a sufficient decrease in temperature to throw the resona-

tors out of sympathy with the tones produced by the bars the resonators are lowered to bring the resonators into sympathy, these adjustments being effected by the obvious manipulation of the screws 9 and 10. To guide the user, the rails 11 may carry indexes or pointers 13 movable over temperature scales 14 that have scale marks that correspond to different temperatures and are located to indicate the places to which the indexes 13 are to be brought to compensate for changes in temperature. There is desirably an index 13 upon each end of each rail 11 and a scale 14 for each index. The scale marks at the lower end of the instrument are wider apart than those at the upper end, the difference in the spaces between the scale marks at the two ends of the instrument corresponding to the variation in lengths of the resonators. The scale marks are thus differently spaced at opposite ends of the instrument because the adjustment must be greater at the lower than at the upper end thereof.

While I have herein shown and particularly described the preferred embodiment of my invention I do not wish to be limited to the precise details of construction shown as changes may readily be made without departing from the spirit of my invention, but having thus described my invention I claim as new and desire to secure by Letters Patent the following:—

A xylophone including a group of sound producing bars; a group of resonator elements for said bars; and mechanism for adjusting one of said groups toward and from the other transversely of the bars.

In witness whereof, I hereunto subscribe my name this twentieth day of October A. D. 1917.

JEFFERSON CLAUDE DEAGAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

April 3, 1928. 1,664,587

C. E. BLALACK ET AL

PIANO

Filed March 12, 1925

Fig. 1

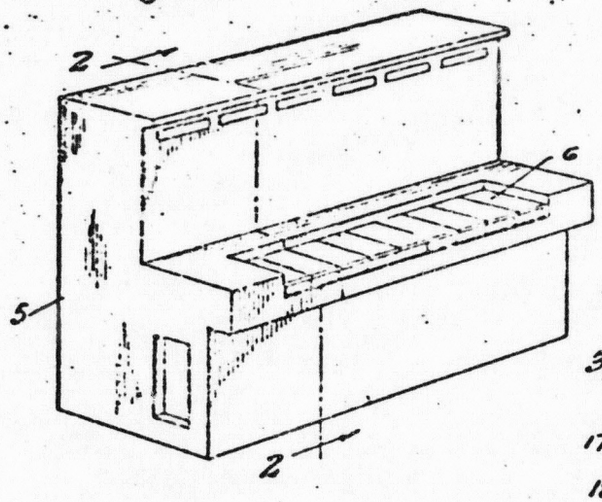


Fig. 2

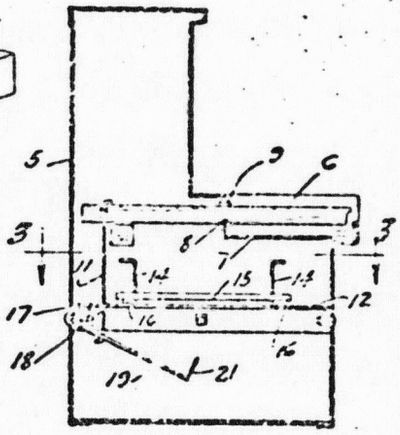


Fig. 3

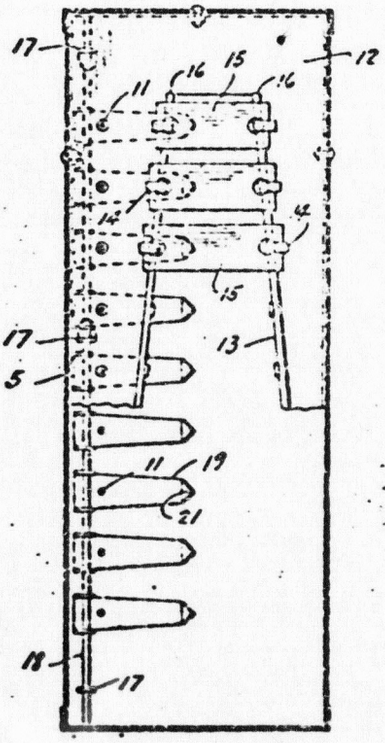
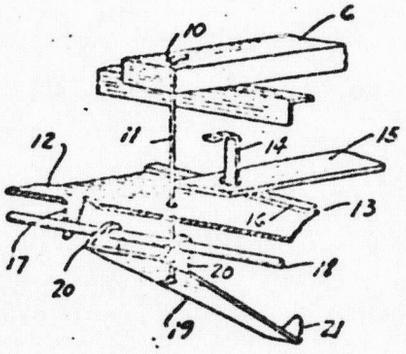


Fig. 4



INVENTOR.
George H. Eckstein
Charles E. Blalock
BY Metcalf and Wallace
ATTORNEYS.

UNITED STATES PATENT OFFICE.

CHARLES E. BLALACK AND GEORGE H. ECKSTEIN, OF LOS ANGELES, CALIFORNIA.

PIANO.

Application filed March 12, 1925. Serial No. 14,967.

This invention relates to a musical instrument and pertains more particularly to that class of instruments which are adapted to be constructed for service as toys. The invention is adapted to be embodied in a miniature piano. More particularly the present invention appertains to an instrument having a set of music bars sounded by hammers.

The primary object of this invention is to provide an instrument of the character described which is simple in structure, economical to manufacture, whose arrangement is adapted to be placed in a small case simulating an upright or grand piano. In addition, to the broader objects of this invention there are certain details of structure, whereby a compact, durable, and strong device is obtained.

These objects together with other objects and corresponding accomplishments are obtained by means of the embodiment of our invention illustrated in the accompanying drawing, in which:

Fig. 1 is a perspective view of the complete instrument; Fig. 2 is a section as seen on the line 2—2 of Fig. 1; Fig. 3 is a section as seen on the line 3—3 of Fig. 2; and Fig. 4 is a fragmentary perspective view showing details of structure, more specifically the music bar and hammer assembly.

Referring more particularly to the drawing, a case 5 is provided, which case may be conveniently made of stamped metal. The case resembles an upright piano and is provided with an instrument board comprising keys 6. The keys 6 arranged in a row extend into the casing being pivotally mounted in a slot formed in a key plate or frame 7 extending the length of the key board. Each of the keys has a nitch 8 in which the key rail wall of the plate 7 rests. The keys may be held in position by a piece of felt 9 inserted between the upper face of the keys and the wall of the slot. Such a construction provides for easy assembly of the keys. The ends of the keys have apertures 10 for receiving links 11.

Secured in the case below the keyboard is a plate 12 having an opening extending longitudinally thereof, the opening being marked by 13. Struck up from the edge of the opening are prongs 14, the prongs being arranged in pairs, the members of which are on opposite sides of the opening. Music bars 15 arranged in a row rest upon the plate 12 over the opening, being loosely held in position by the prongs 14 which are disposed in apertures in the bars and held against displacement by a laterally turned portion of the prongs. This mounting is best shown in Fig. 4. The music bars may rest upon felt strips 16 extending along the edges of the opening. The construction is such that upon striking a bar, a musical note will be produced.

Ears 17 are provided on the plate 12 and extend downwardly. These ears are bored to provide bearings for a shaft 18 which extends the length of the case. Journalled on the shaft 18 are hammers 19 arranged in a row, one for each music bar and its corresponding key.

These hammers may be conveniently made of stamped metal comprising a flat body having ears 20 serving as bearings and a head 21. The links 11 may consist of wires extending through the openings 10 in the keys and through similar openings in the hammers. The ends of the links are bent laterally as best shown in Fig. 4, thereby fastening the keys and hammers together. The operation is obvious. A key is struck thereby rocking it, raising its link and moving the corresponding hammer upwardly so as to strike from below and sound the proper music bar. Upon release of the key, the weight of the parts is such as to cause the hammer to gravitate to its inactive position as shown in Figs. 2 and 4, the key also being restored. In the present construction, the parts are so arranged that they may be installed in the lower portion of the case, thereby better permitting a construction simulating an upright piano the keys, hammers, and music bars being arranged in a tier with the music bars interposed between the keys and hammers. The parts are also of such a nature that they

may be economically made and assembled.

What we claim is:

1. In a toy piano, the combination of a case having key mounting, a row of keys pivotally disposed therein and extending into the case, said case having a music bar support disposed therein, a row of music bars mounted on said support, a shaft extending along and mounted upon said support, a row of hammers pivotally mounted on said shaft, each hammer being formed of sheet metal having lateral bearing ears at one end and an upturned head at the other, said keys and said hammer having aligned holes, link rods loosely extending through said holes and having laterally directed locking ends, said keys, music bars and hammers being arranged in a tier with the row of music bars in the center.

2. In a toy piano, the combination of a case having a key mounting, a row of keys pivotally disposed therein and extending into the case, a music bar support plate within said case having an opening extending longitudinally thereof, a row of music bars transversely spanning said opening, said plate having brackets struck up therefrom, a shaft extending along the length of said opening and mounted in said brackets, a row of hammers pivotally mounted on said shaft and located so as to strike said bars through the opening of said plates, and operating links connecting said hammers and keys, said keys, music bars and hammers being arranged in a tier with the row of music bars in the center.

3. In a toy piano, the combination of a case having a key mounting, a row of keys pivotally disposed therein and extending into the case, a music bar support comprising a plate having an opening extending longitudinally thereof, said plate being disposed in said case, music bars transversely spanning the opening in said plate, said plate having brackets struck up therefrom, a shaft extending along the length of said opening and mounted in said brackets, a row of hammers for said bars mounted upon said shaft, and operating links connecting said hammers and keys, said keys, music bars and hammers being arranged in a tier with the row of music bars in the center.

4. In a toy piano, the combination of a case having a key mounting, a row of keys pivotally disposed therein and extending into the case, a music bar support disposed in said casing and comprising a plate having an opening extending longitudinally thereof, said plate having prongs struck up therefrom on opposite sides of said openings, a row of music bars having holes at the ends through which said prongs are passed so that said bars are loosely mounted thereon, the ends of said prongs being bent laterally, hammers for said bars mounted so as to strike the bars through the opening in said plate and operatively connecting said hammers and said keys, said keys, music bars and hammers being arranged in a tier with the row of music bars in the center.

5. In a toy piano, the combination of a case having a key mounting, a row of keys pivotally disposed therein and extending into the case, a music bar support comprising a plate having an opening extending longitudinally thereof, said plate having prongs upstanding therefrom at the edges of said opening, a row of music bars transversely spanning said opening and having holes at the ends thereof through which said prongs extend, said prongs being bent laterally to lock said bars in position, said plate having brackets struck up therefrom, a shaft extending along the length of said opening and mounted in said brackets, a row of hammers pivotally mounted on said shaft and arranged to strike said bars through said opening, said keys and said hammers having aligned holes, link rods loosely extending through said holes and having laterally directed locking ends, said keys, music bars and hammers being arranged in a tier with the row of music bars in the center.

6. In a toy piano, the combination of a case having a key mounting, a row of keys pivotally disposed therein and extending into the case, said case having a music bar support disposed therein, said support comprising a plate having an opening extending longitudinally thereof, a row of music bars transversely spanning said opening, said plate having brackets struck up therefrom, a shaft extending along the length of said opening and mounted in said brackets, a row of hammers formed of sheet metal each having lateral bearing ears at one end and an upturned head at the other, a shaft extending along and mounted upon said support, said hammers being pivotally mounted on said shaft which extends through said ears, said keys and said hammers having aligned holes, link rods loosely extending through said holes and having laterally directed locking ends said keys, music bars and hammers being arranged in a tier with the row of music bars in the center.

7. In a toy piano, the combination of a music bar support comprising a plate having an opening extending longitudinally thereof, music bars transversely spanning said opening, said plate having brackets upset therefrom and extending below the plane thereof, a shaft extending along the length of said opening and mounted in said brackets, hammers formed of sheet metal, each hammer having lateral bearing ears at one end and an upturned head at the other, said hammers being pivotally mounted on said shaft which extends through said bearing

ears, said keys, music bars and hammers being arranged in a tier with the row of music bars in the center.

8. A music bar support comprising a plate having an opening extending longitudinally thereof, said plate having prongs upstanding therefrom at the edges of said openings, music bars transversely spanning said opening and provided with holes, the prongs extending loosely through the holes in said bars, said keys, music bars and hammers being arranged in a tier with the row of music bars in the center.

In witness that we claim the foregoing we have hereunto subscribed our names this 6th day of March, 1925.

CHARLES E. BLALACK.
GEORGE H. ECKSTEIN.

404

March 26, 1929. O. O. FUSCH 1,707,057

POWER OPERATED MUSICAL INSTRUMENT

Filed Dec. 28, 1926

Fig. 1.

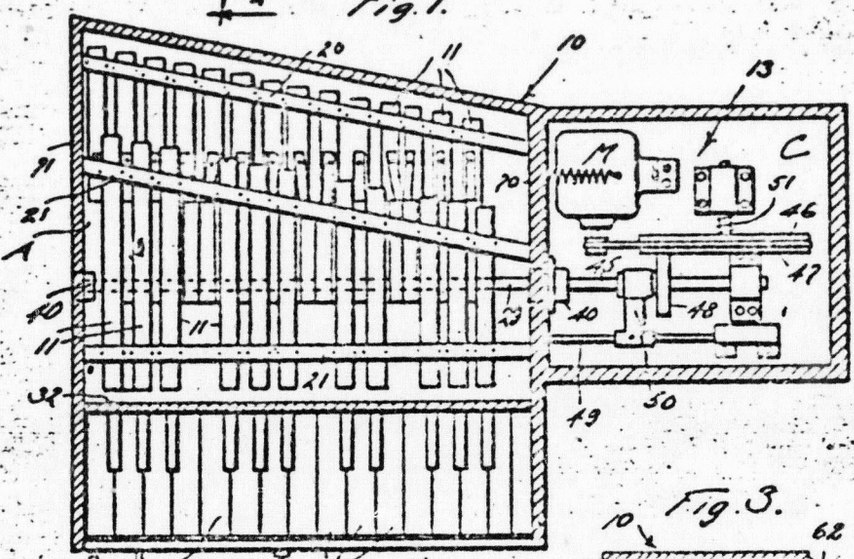


Fig. 3.

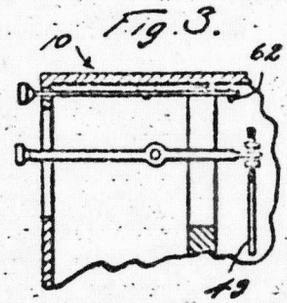


Fig. 2.

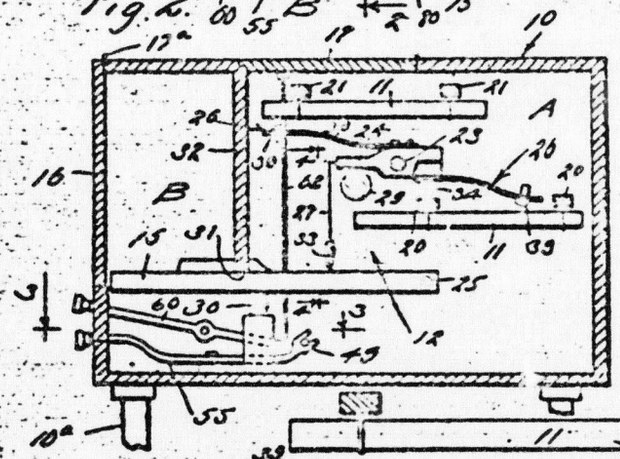


Fig. 4.

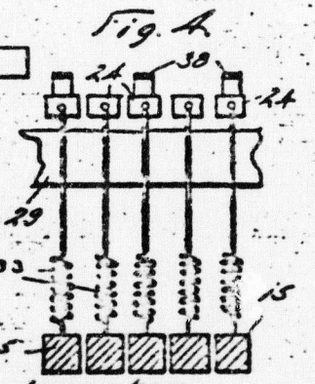
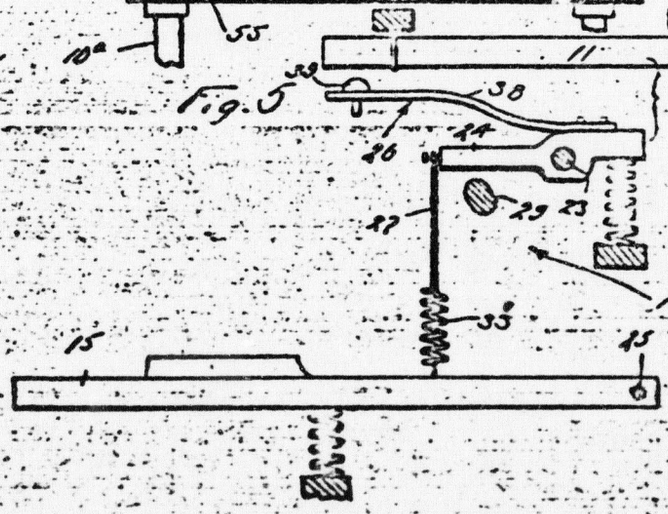


Fig. 5.



Inventor
Otis O. Fusch
by W. H. Maxwell
his Attorney

404

Patented Mar. 26, 1929. 1,707,057

UNITED STATES PATENT OFFICE.

OTIS O. FUSCH, OF BELLFLOWER, CALIFORNIA.

POWER-OPERATED MUSICAL INSTRUMENT.

Application filed December 28, 1926. Serial No. 157,463.

This invention has to do with a musical instrument and has particular reference to a power operated musical instrument.

Xylophones, orchestra bells, and various other like and similar musical instruments such as are commonly used in orchestras, are difficult to play, as the sounding members must be rapidly and uniformly struck by means of hammers, or the like. The proper operation of hammers employed in playing these instruments requires extensive practice.

It is an object of my present invention to provide a device for playing orchestra bells or other similar musical elements whereby the elements are struck with the desired rapidity and regularity through depression of suitable control keys.

It is an object of my invention to provide an instrument of the character mentioned, which is simple and compact, making it suitable for use in orchestras and the like where it is necessary that the instruments be portable.

It is another object of my invention to provide an instrument of the character mentioned, which can be operated at the will of the operator to strike the sounding members at various speeds

Another object of my invention is to provide an instrument of the character described, with an extremely simple, effective and inexpensive movement, or key controlled mechanism.

The various objects and features of my present invention will be best and more fully understood from the following detailed description of a typical form and application of the invention, throughout which description reference is had to the accompanying drawings, in which:

Fig. 1, is a top or plan view of my improved instrument showing it with the top or upper portion of the casing removed;

Fig. 2, is a detailed, transverse, sectional view of the instrument taken as indicated by line 2—2 on Fig. 1;

Fig. 3, is a detailed plan view of a portion of the instrument, being a view taken as indicated by line 3—3 on Fig. 2;

Fig. 4, is an enlarged sectional view of a portion of the instrument, being a view taken as indicated by line 4—4 on Fig. 2: and

Fig. 5 is an enlarged view, illustrating the movement or striking mechanism provided by my invention.

My present invention may be employed or carried out with sounding elements of various kinds and I may state for example, that the invention may be employed to actuate the sounding elements of orchestra bells, xylophones, or the various elements of traps employed in bands, orchestras, etc. In this connection, it is to be understood that the invention may be carried out to actuate a combination of different types of sounding elements. For purpose of example, I will refer to the invention as being applied to the actuation of orchestra bells as such elements present a typical condition that can be advantageously handled by my present invention.

The device embodying my invention includes, generally, the striking mechanism 12, operable to actuate the elements 11, drive means 13 which actuates the power operated element of the striking mechanism, and various other parts and features, the details of which will be hereinafter described.

The casing 10 includes, generally, a main compartment A, which carries the sounding elements 11, a key compartment B at which is located the control keys 15, and a drive compartment C, which carries the drive means 13. The main compartment A, is shaped and proportioned to properly accommodate the sounding elements 11, and in any particular case, the shape and size of this compartment will depend upon the number, size, arrangement, and character of the sounding elements. It is preferred however, in practice, to arrange the parts within the compartment A, so that they are as compact as possible. One part, for instance, the top of the compartment A, is formed with a hinged portion or section 17, adapted to be opened and closed to control the volume of sound from the instrument. In practice, I may line the compartment A, and if desired the compartment C, with sound deadening material, such as felt or the like. The key compartment B is located at the front of the compartment A, and has a plurality of control keys 15 projecting into it from the compartment A. The front 16 of the compartment B is mounted on hinges 17ª or in any other suitable manner so that it can be removed or swung out of position at the front

of the compartment B, making the keys 15 accessible for operation. The drive compartment C, may be located at one end of the compartment A, to carry the various parts or drive means 13 as will be hereinafter described. The casing 10, may be provided with supporting legs 10^a or it may be added to or made a port of some other instrument.

The sounding elements 11, illustrated in the drawings are in the nature of orchestra bells and for purpose of compactness, I have arranged them in two series, and have spaced the two series, one above the other, in the compartment A. The lower series of bells 11, is carried by or suspended from suitable carriers 20, which extend between the ends 70 and 71 of the compartment A. The upper series of bells is supported a substantial distance above the lower series and is carried by or suspended from the carriers 21, which extend between the ends of the compartment A. The general arrangement of the bells in the compartment A, will be understood from inspection of the Figs. 1 and 2, of the drawings.

The striking mechanism 12, includes, generally, a rod 23 located between the two series of bells and extending parallel with the series of bells between the ends 70 and 71 of the compartment A, levers 24, mounted on the rod, keys 15 mounted on a rod 25, hammers 26 carried by the levers, connections 27 between the keys and levers, and a power operated member 29 for actuating or oscillating the levers. The principle of construction and operation employed in striking each key being the same, I will proceed to describe one single mechanism, it being understood that the description applies to all.

The lever 24 is freely carried on the rod 23, at a point substantially opposite the bell to be played, while the key 15 for operating the lever 24 is freely carried on the rod 25 at a point opposite or substantially in line with the lever 24. The key 15 extends forward from the rod 25 to project from the compartment A into the compartment B where it can be engaged by the operator. The key is normally held in the up position by a suitable spring 30. The upward movement of the key may be limited by the lower edge 31 of the partition 32 which separates the compartments A and B. The operating connection between the lever 24 and key 15 extends downwardly from one end of the lever and connects with the key at a point removed from its pivotal mounting. The connection includes a resilient element, for instance, a spring 33. A second spring 34 is arranged in connection with the lever 24, for instance, under its other end, to counteract or urge the lever in the direction opposite to the direction to which it is urged by the spring 33. The springs 33 and 34 are balanced or related so that the lever 24 is held in the position shown in Fig. 2 when the key 15 is in the normal unactuated position. When the key is actuated or depressed, the connection 27 causes the lever 24 to be operated or moved to the operated position. The hammer 26 includes a spring arm 38 extending from the lever 24 and a head 39 carried on the outer part of the arm. The arm 38 is shaped and proportioned so that the head 39 is carried in position to strike the bell when the device is operated as hereinafter described. The power operated element or member 29 is in the form of a cam extending parallel with the rod 23 at a point to be engaged by the lever when the lever is moved to the down position. The cam 29 is rotated through the drive means 13 hereinafter described, and is shaped, for instance, as shown in the drawings, so that it oscillates or vibrates the lever when the parts are in operating position. In the arrangement shown, the head 39 is normally spaced from the bell, but when the arm 24 is oscillated or vibrated, the resiliency of the arm 38 allows the head to strike the bell. The rate at which the bell is struck by the hammer will, of course, depend upon the speed at which the cam 29 is driven. The cam 29 is carried by or between suitable bearings 40 at the ends 70 and 71 of the compartment A, and thus extends past all of the levers 24 to operate any lever that may be depressed through depression of its corresponding key.

The drive means 13 provided for actuating the cam is located in the compartment C, and includes, generally, a source of power such as a motor M, a shaft 45, which extends into the compartment C from or as, a continuation of the cam, and a variable speed drive between the motor M and shaft 45. In practice, I have found it advantageous to employ a friction drive, and in the arrangement shown in the drawings. I drive a friction disk 46 from the motor through a suitable belt 47 and I provide a friction wheel 48 on the shaft 45 to engage the face of the disk. The friction wheel 48 may be slidably keyed to the shaft 45 and may be shifted with reference to the disk through a rod 49 which carries an arm 50 engaging the hub of the wheel 48. A spring 51 may be arranged in connection with the disk 48 to urge it toward the wheel 48 to maintain the disk and wheel in driving contact. It will be obvious that shifting of the wheel to various positions on the disk will vary the speed at which the cam is driven. The rod 49 by which the wheel is shifted may be operated from any convenient point, for instance, from a point at the front of the casing 10 immediately below the key board of the instrument. In the drawings. I have shown a lever 55 operatively connected with the rod 49 and having one end at the exterior of the instrument immediately below the key board.

It is desirable to provide means for con-

veniently operating the movable top part 17 of the compartment A, and for this purpose I may provide a lever 60 having one end accessible from the exterior of the device adjacent the key board and the other end operatively connected with the part 17 by a rod 62.

In carrying out my invention I may increase the size or range of the instrument by adding additional units of sounding elements to the end 71 of the casing 10. These additional units may include striking mechanisms and the cams of such mechanisms may be attached to the cam above described so that the whole instrument is operated from the means 13.

In operation, the motor may be operated continuously, it being preferred to employ a constant speed motor. The motor is preferably under control of a switch having an operating part 80 located adjacent the key board. With the motor in operation, the cam 29 is driven through the drive above described. When it is desired to strike one of the bells, its corresponding key is depressed, causing its lever 24 to be moved down into engagement with the cam so that the cam trips or vibrates it, resulting in the vibration of the hammer carried by the said lever so that the hammer strikes the bell. The speed at which the hammer is vibrated, or in other words, the speed at which the bell is struck will depend upon the speed of rotation of the cam, this being under control of the operator through the control lever 55, which is connected with the shiftable friction wheel 48. In view of the fact that all of the levers 24 are in position to be engaged by the cam 20, all notes or bells played simultaneously will be struck at exactly the same rate. I have found in practice, that the variable speed control makes it possible for an operator to very easily control the speed at which the notes are struck, and it is possible to manipulate the controls to obtain very pleasing results.

Having described only a typical preferred form of my invention, I do not wish to limit myself to the specific details set forth, but wish to reserve to myself any changes or variations that may appear to those skilled in the art or fall within the scope of the following claims.

Having described my invention, I claim:

1. A musical instrument including a sounding element, a hammer unit operable to strike the element, the hammer unit including a pivoted lever and a spring arm directly attached to the lever, a continuously operating cam, and control means whereby the hammer and cam unit are directly related so that the cam directly engages the lever causing the hammer to strike the element.

2. A musical instrument including a sounding element, a hammer, a cam, power means for continuously operating the cam, means for varying the speed of operation of the cam, and control means whereby the hammer is moved with relation to the cam so that the cam operates the hammer to strike the element.

3. A musical instrument including a sounding element, a hammer, a continuously operating cam, and control means whereby the hammer and cam are related so that the cam operates the hammer to strike the element, said control means including a lever carrying the hammer, a key, and a direct connection between the lever and key whereby operation of the key moves the lever into position to be directly engaged by the cam.

4. A musical instrument including a sounding element, a hammer, a continuously operating cam, and control means whereby the hammer and cam are related so that the cam operates the hammer to strike the element, said control means including a lever carrying the hammer, a key, and a direct connection between the lever and key whereby operation of the key moves the lever into position to be directly engaged by the cam, said connection including a spring.

5. A musical instrument including a sounding element, a hammer unit, a continuously operating cam, and control means whereby the hammer and cam unit are related so that the cam directly operates the hammer to strike the element, the hammer including a pivoted lever directly engaged by the cam, a spring arm having its inner end attached to the lever, and a head carried by the outer part of the arm.

6. A musical instrument including a sounding element, a hammer, a continuously operating cam, and control means whereby the hammer and cam are related so that the cam operates the hammer to strike the element, said control means including a lever carrying the hammer, a key and a connection between the lever and key whereby operation of the key moves the lever into position to be engaged by the cam, the hammer including a spring arm carried by the lever and a head on the outer part of the arm.

7. A musical instrument including, a sounding element, a hammer, a rotating cam for operating the hammer, and means for operating the cam including, a motor, and a variable speed drive between the motor and cam.

8. A musical instrument including, a sounding element, a hammer, a rotating cam for operating the hammer, and means for operating the cam including, a motor, and a variable speed drive between the motor and cam including a friction disk driven by the motor and a friction wheel connected with the cam and movable to engage different parts of the disk.

9. A musical instrument including a case having three compartments, a sounding element in one compartment, means for striking the element including a cam in said compartment and a key in one of the other compartments, variable speed operating means for the cam and located in the third compartment, and means whereby the operating means is controllable from a point adjacent the key.

In witness that I claim the foregoing I have hereunto subscribed my name this 20th day of Nov. 1926.

OTIS O. FUSCH.

Sept. 1, 1936. I. MARKS 2,052,890

TOY PIANO

Filed Oct. 18, 1935 3 Sheets-Sheet 1

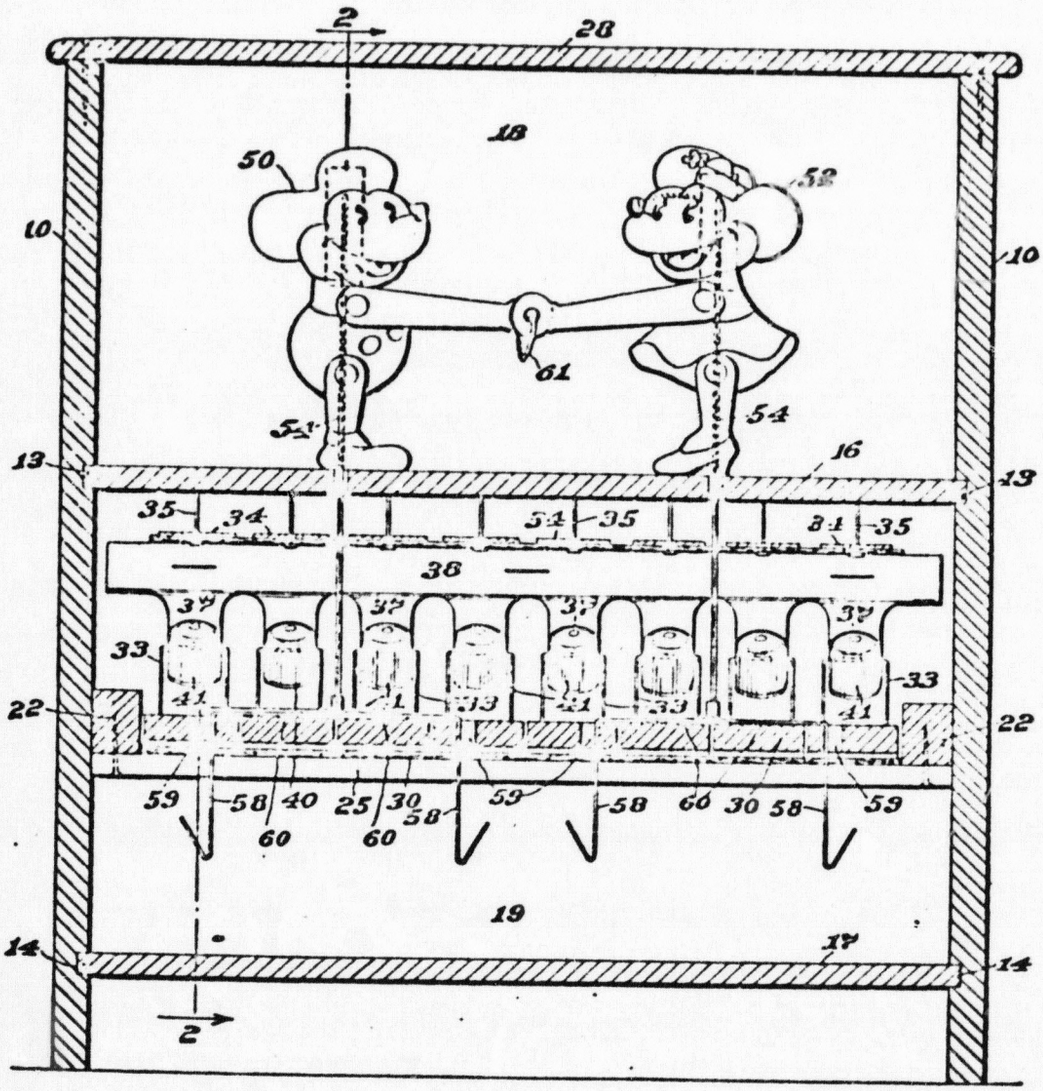


Fig. 1

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Sept. 1, 1936. I. MARKS 2,052,890

TOY PIANO

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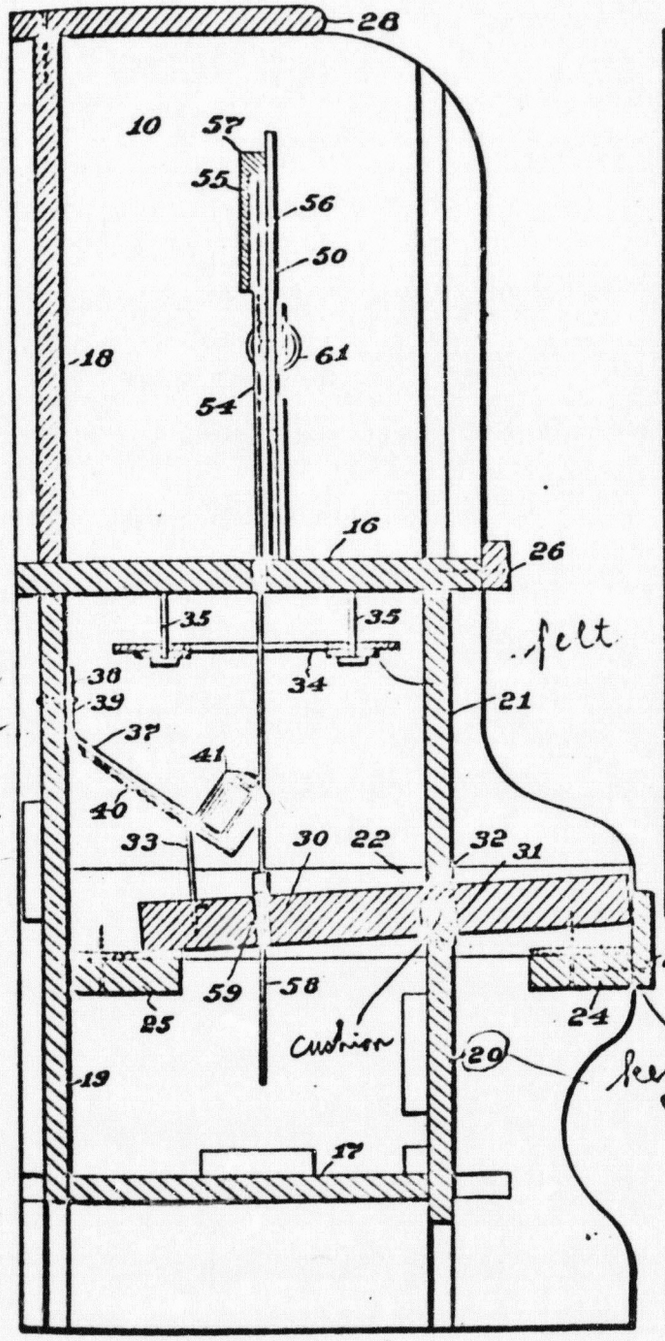

Fig. 2

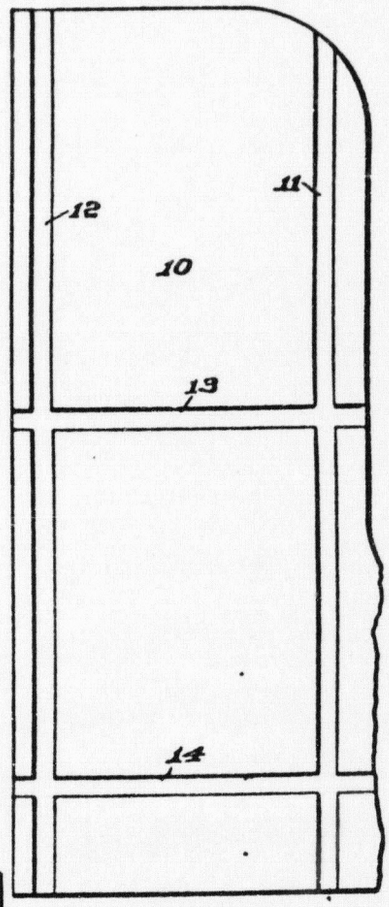

Fig. 3

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TOY PIANO

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Fig. 4

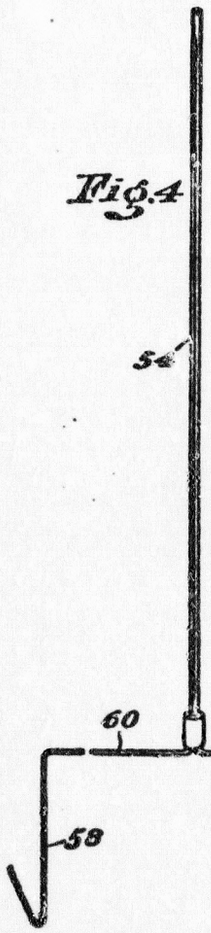


Fig. 5

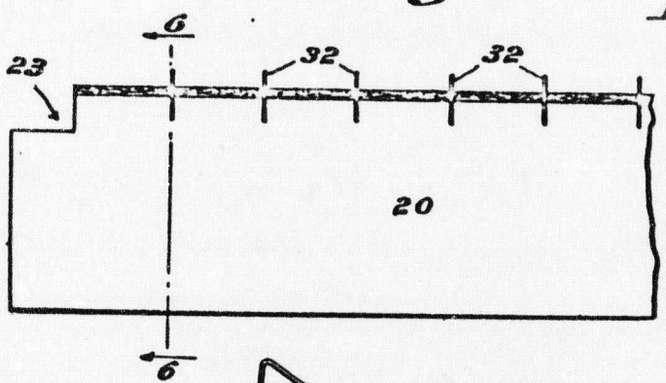


Fig. 6

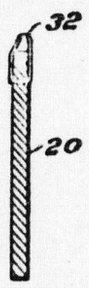


Fig. 7

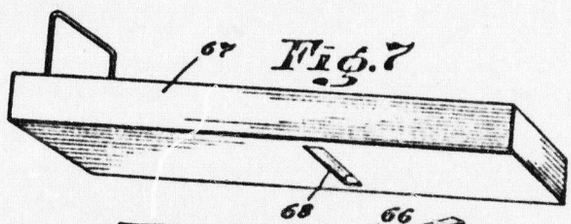
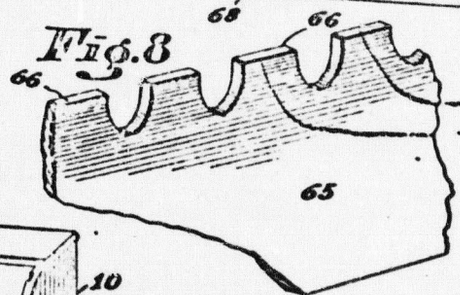
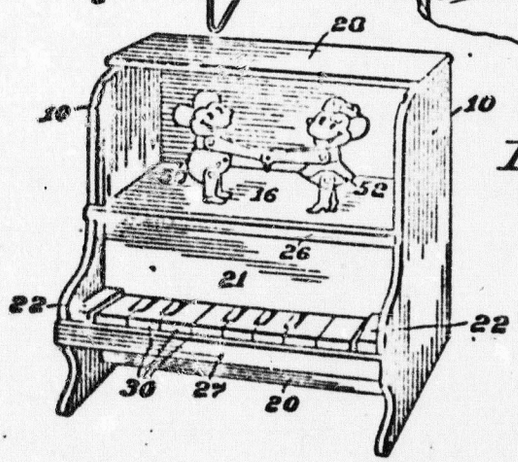


Fig. 8



key supports

Fig. 9



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Patented Sept. 1, 1936 2,052,890

UNITED STATES PATENT OFFICE

2,052,890

TOY PIANO

Isidore Marks, Boston, Mass.

Application October 18, 1935, Serial No. 45,565

12 Claims. (Cl. 46—118)

This invention relates to mechanical toys of the kind having an animated figure or figures which simulate dancing on operating the toy. The invention is embodied herein in a toy piano provided with a dancing floor having figures apparently standing thereon which become animated and dance upon the floor when the piano is played.

The objects of the invention are to insure a continuous movement of the dancing figures while playing the piano through actuation from all of the keys of the keyboard with free action of the articulated parts of the dancing figures; to so mount a pair of dancing figures that they cannot rotate or turn their backs to the piano player; and to so simplify the construction of toys of this character that they may readily be assembled by the unskilled labor employed in toy factories.

To the accomplishment of these objects and such others as may hereinafter appear, as will readily be understood by those skilled in the art, the invention comprises the features and combinations of parts hereinafter described and then particularly pointed out in the appended claims.

In the embodiment of the invention illustrated in the drawings:

Figure 1 is a view of a toy piano, in transverse section, in which the improvement of this invention has been incorporated;

Fig. 2 is a view, in fore and aft section, on the line 2—2 of the toy piano shown in Fig. 1;

Fig. 3 gives an inside view of an end board of the toy piano showing how it is cross-grooved to facilitate assembly;

Fig. 4 is a detail view of the support for a dancing figure;

Figs. 5 and 6 are front and sectional views, respectively, of the key-board support for the piano keys;

Fig. 7 is a view, in underside perspective, of a piano key having a modified form of notch;

Fig. 8 is a view, in perspective, of a portion of a modified form of spacer bar for supporting notched keys as shown by Fig. 7; and

Fig. 9 is a view, in perspective and on a smaller scale, of the toy piano as it appears after assembly.

Describing the illustrated toy piano as one practical embodiment of the invention the piano case comprises two end boards 10 each provided on its inner face with a front vertical groove 11, a rear vertical groove 12, an upper horizontal groove 13 and a lower horizontal groove 14, all of which are continuous from edge to edge of the end board (Fig. 3). A floor board 16 for the dancing figures has its ends seated in the two upper grooves 13 and a bottom board 17 is similarly seated in the two lower grooves 14 thus spacing the end boards 10 apart. The spacing may be such that the key-board of the piano consists of one octave or eight keys, as shown, or there may be two or more octaves, the length of the key-board depending on the size of the piano. The back comprises two boards set in the rear grooves 12, one, 18, above the dancing floor and one, 19, below it. The front also comprises two boards set in the front grooves 11, one 20, which serves as a key supporting and spacing bar (Figs. 5 and 6) below the key-board and one 21, above the key-board. A fore and aft bracer 22 is secured to each end board intermediate the horizontal grooves 13 and 14, passing through cut-out corners 23 (Fig. 5) of the spacer bar, and serving to support a front felted mute 24 for the forward ends of the piano keys and a rear felted mute 25 for the rear ends of the piano keys (Fig. 2). Trim strips 26 and 27 are placed across the front edge of the dancing floor and the front mute, respectively. A top board 28 forms a sort of stage for the dancing figures.

Proceeding now to a description of the piano action and its effect upon the figures on the dancing floor before describing novel method of assembling the various parts, the key-board as herein shown for convenience of delineation comprises eight keys 30 which may be painted to simulate sharps and flats even though the notes produced sound but a single octave. Each key has an under notch 31 (Fig. 2), conveniently a cross groove by which it may be pivotally seated on the cushioned top edge of the spacer bar 20. The spacer bar (Fig. 6) carries a series of spaced wire clips 32 clenched into the bar thus insuring separation of the keys, preventing rubbing and preserving their individual action. The notches 31 are somewhat forward of center so that the keys normally assume a tilted position with their rear ends resting on the rear mute 25 (Fig. 2). Each key carries a wire loop 33 at its rear end which engages the cushioned under side of a movable hammer that may be thrown upward by the key action to engage one of a series of xylophone plates to sound the notes.

The xylophone plates 34 may conveniently be strung in a row, each on two headed nails 35 driven into the lower face of the dancing floor 16, strips of felt or the like being threaded on the nails and lying beneath the plates to mute the

notes as they fall back after being struck and lifted by the hammers.

The eight note strikers are conveniently secured as a single unit to the lower back board 19. To accomplish this a piece of relatively strong fabric is cut with eight tabs 37 depending from a top strip 38 which may be folded over a reinforcement 39 for strength and is secured, as by stapling, to the back board. Each tab is provided with a stiffener 40 and its under face and the stiffener is felted for silence. At its free end each tab carries a wood hammer 41 which may have a nail for striking a note-plate 36 located above it and in its path of movement. The hammers move individually upon the strip 38 as a hinge when actuated by an upward movement of the rear end of a co-acting piano key.

It will be observed that the construction just described provides for a preliminary assembly of the strikers and back board and of the xylophone plates and dancing floor thus permitting these otherwise loose parts to be handled as a unit as the piano is being built. These preliminary assemblages also facilitate placing the keys as a unit in co-acting position as will appear later.

Referring now to the animated figure and to the manner in which it is actuated to simulate dancing when the piano is played, the figure or, as illustrated, the figures 50 and 52 may be made of cardboard, colored to represent a well known cartoon subject if desired, and having the arms and legs loosely pivoted to the body. In the present instance two dancing figures are shown each mounted loosely on the upper end of a reciprocatory rod 54 passed upward through a hole in the dancing floor 16. The back of each figure carries a block 55 (Fig. 2) conveniently grooved at its inner face. This groove 56 has an open bottom for receiving the rod 54 and has a closed top 57 so that the figure is suspended on the end of the rod and will be thrown upward when the rod rises and settle back thereon when the rod rescends.

The rod 54 is reciprocated, and the figure suspended thereon thus animated, by movement of the piano keys. The rod 54 is conveniently formed of a pair of wires soldered at the upper end, or a single doubled wire (Fig. 4) which may be soldered at the upper end. The two strands are branched laterally at their lower ends forming an inverted T, finally terminating in two spaced legs 58. An eyelet may be placed at the branch if desired to prevent spreading. The spacing of the legs 58 may be any desired distance but with an eight-key key-board and two dancing figures it is appropriate to animate each figure from any one of four keys. Accordingly as illustrated, the legs 58 are so spaced as to pass downward through enlarged holes 59 in the first and fourth key for one leg and in the fifth and eighth key for the other leg. As a safety device each leg 58 may be hooked at its lower end as shown in Fig. 4 said hook yielding as it is forced down through the hole in a key and then springing outward again. When the piano is not being played the lateral branches 60 (Fig. 1) of each figure-supporting rod, as illustrated, lie above and rest upon the rear portions of four adjacent keys. Playing any one of these four notes will cause said rod to reciprocate, throwing the figure upward and permitting it to drop back thus jiggling its arms and legs. A sharp striking of a key might throw the figure off of the rod but the proportionate size of the figure to the height of the "stage" purposely is such that the figure's head will strike the top board 28 before the figure can leave its supporting rod. With the construction shown both figures will dance continually while the piano is being played.

The loose mounting would permit a figure to rotate on the rod 54 unless constrained. In order to ensure that the two figures are continually forwardly-facing a connecting ring 61 is passed through holes in the four hands of the two figures thus preventing either figure from rotating relatively to the other.

Figs. 7 and 8 illustrate a modified, but a simple and thus probably a preferable, form of key mounting. In this instance the key support and spacing bar 65 is provided with a heavy saw-tooth formation at its upper edge, each comparatively wide tooth 66 forming a support for a single key 67. Each such key has a notch 68 in its under face corresponding to the notch 31 (Fig. 2) but of less length than the width of the key and otherwise of such dimensions as to fit a little loosely over the squared end of a tooth 66. Engagement of the side walls of a tooth with the end walls of a notch 68 positively prevents lateral displacement of any key and the spacing of the teeth is such that each key has free individual action. This form of key mounting eliminates key spacing elements and it is not essential to use a soft packing on the edge of the key support. The front board 21 (Fig. 9) holds the entire key-board down.

The various parts of the piano action are purposely designed for ease of assembly by unskilled labor. In the toy factory the strikers are preliminarily fastened to the back board 19 and xylophone plates to the dancing floor 16 thus facilitating their assembly. The end boards having been spaced by the connected fore-and-aft bracers 22, the key-supporting bar 20 may then be slipped into the spaced end board grooves 11 below said bracers. Each figure supporting wire carrying the two perforated keys is threaded through its appropriate hole in the dancing floor 16 and the floor is then slipped into the end board grooves 13 and pushed well back while all the keys are fitted on the spacer bar and the front board 21 is slipped in the end board grooves 11. Sliding the dancing floor well forward the back board 19 may be slipped into the end board grooves 12, tilting the assembly at this time so that the strikers will seat upon the key loops 31. The dancing floor being re-centered, the bottom and back boards 17 and 18 may be slipped into and secured in their grooves, the figures placed on the wires, and finally the top board 28 and trims secured in place. It will be understood that the felts are all secured on their respective supports prior to assembly. The principal securement is by glue and cleats as in the manufacture of furniture. Thus a simple mode of assembly by slipping the parts into prepared guides is provided for a toy having a piano action.

Having described the nature of the invention in its preferred form but recognizing that changes may be made in the structure and its mode of assembly may be varied, the described embodiment is intended as an exploitation of the underlying essentials of the invention the true scope of which will be found in the claims herewith.

What is claimed as new, is:—

1. In a toy piano of the type described having a figure mounted above the key-board on a movable means and animated by a movement of said means on playing the piano, characterized by the

fact that said movable means is associated with and actuated by any one of a plurality of the piano keys.

2. The construction according to claim 1 in which said movable figure supporting means consists of a reciprocatory rod having a lower part extending laterally, and contacting the upper rear portions of said plurality of the piano keys.

3. In a toy piano of the type described having a figure above the key-board and reciprocatory means intermediate said figure and the key-board serving, on playing the piano, to jiggle the figure and simulate dancing, characterized by a socket carried by said figure, and said reciprocatory means comprising a rod the upper end of which enters said socket loosely and the lower end of which is branched to contact several keys, whereby said rod is reciprocated to jiggle said figure by the movement of any one of a plurality of keys.

4. In a toy piano of the type described having a dancing figure above the key-board mounted on a rod adapted to be reciprocated on playing the piano, said rod having the form of an inverted T the figure supporting stem of which consists of two strands of wire, the lower ends of said strands branching laterally in opposite directions and overlying certain piano keys and the upper ends thereof being connected.

5. The construction according to claim 4 characterized by the fact that said T-rod is formed from a single piece of wire bent upon itself to form its two strand stem.

6. The construction according to claim 4 characterized by the fact that said T-rod is provided with a leg depending from each lateral branch having a hook at its lower end.

7. A toy piano having, in combination, a key-board, two dancing figures above the key-board each having a body with jointed arms and legs, each figure being mounted loosely on the upper end of a rod, both rods passing downward and each associated with certain of the piano keys to be reciprocated by rocking said keys, said figures facing each other with arms extended and said extended arms being connected, thereby preventing a rotation of either figure as it jiggles on its supporting rod when the piano is played.

8. In a toy piano of the type described having a stage above the key-board, a rod adapted to be reciprocated on playing the piano and passing upward through the stage and a figure on said stage supported by the rod, characterized by a key-board including at least one octave having two non-adjacent perforated keys, the lower end of said rod being branched laterally in opposite directions, each branch having a leg and said legs passing downward each through one of said perforated keys, whereby said lateral branches will overlie both said perforated and the intervening keys.

9. The construction according to claim 8 characterized by a plurality of said branched rods with a figure supported on each, and the branches of each rod overlying a portion of the keys but together overlying the entire key-board.

10. The construction according to claim 8 characterized by two branched rods with a figure supported on each, the branches of each rod overlying one half of the keys of the key-board, some of the members of said figures extending toward each other and such members being secured together.

11. In a toy piano of the type described having a stage above the key-board, a rod passing upward through the stage and associated with one or more of the keys for reciprocation thereby when the piano is played and a figure on said stage supported by the rod, said support for the figure consisting of a socket on the figure having an open lower end and closed upper end for receiving the upper end of the rod and loosely suspending the figure thereon, permitting the figure to move up and down on the rod as the rod reciprocates during the playing of the piano.

12. The construction according to claim 11 characterized by a cover above the dancing floor at a height above the figure such that upward movement of the figure on the rod will be terminated by the figure hitting said cover before said socket can leave the rod.

ISIDORE MARKS.

265

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April 7, 1942. R. J. LOHR 2,279,143

TOY PIANO

Filed Aug. 15, 1939

Fig. 1.

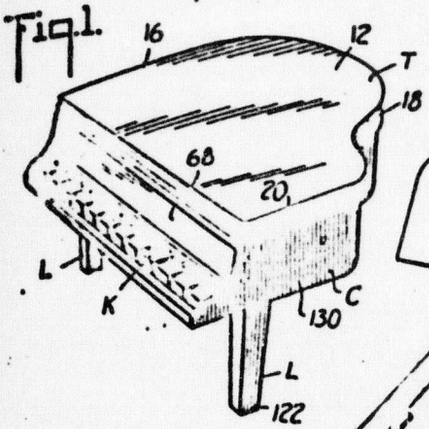


Fig. 2.

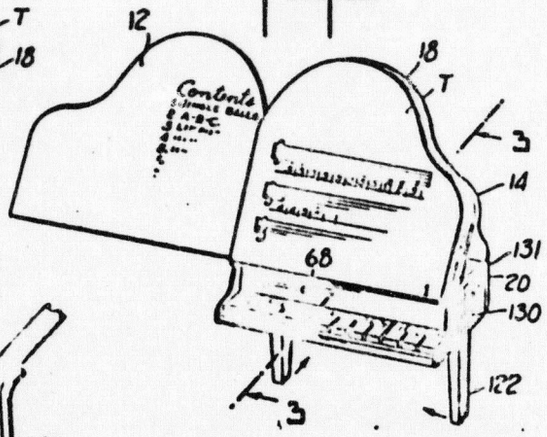


Fig. 3.

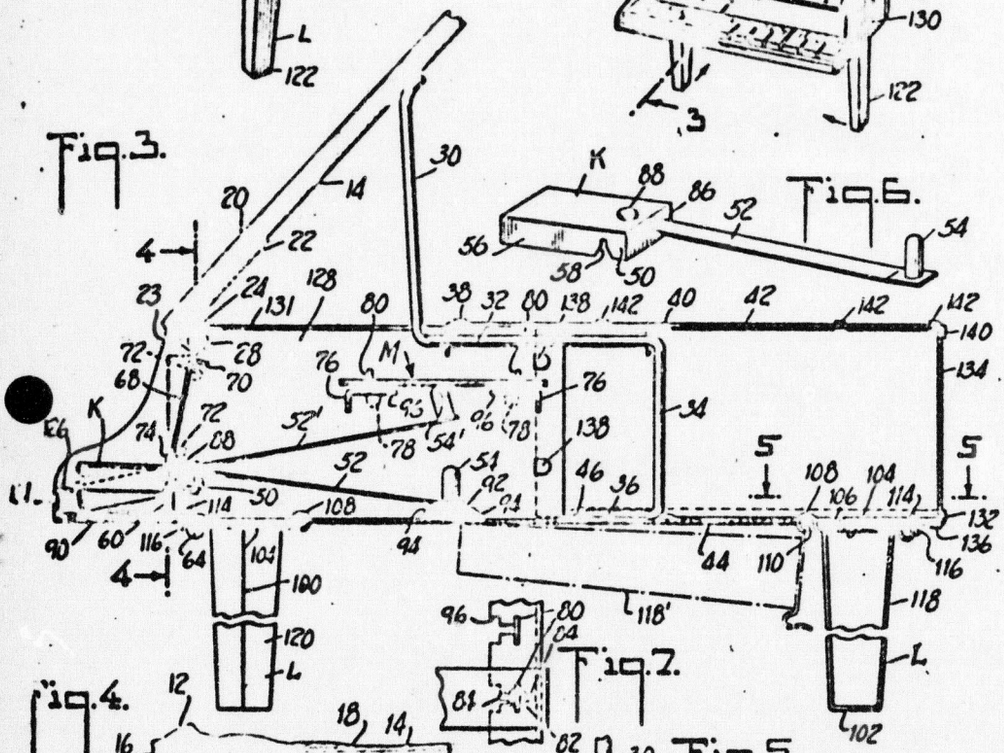


Fig. 6.

Fig. 7.

Fig. 4.

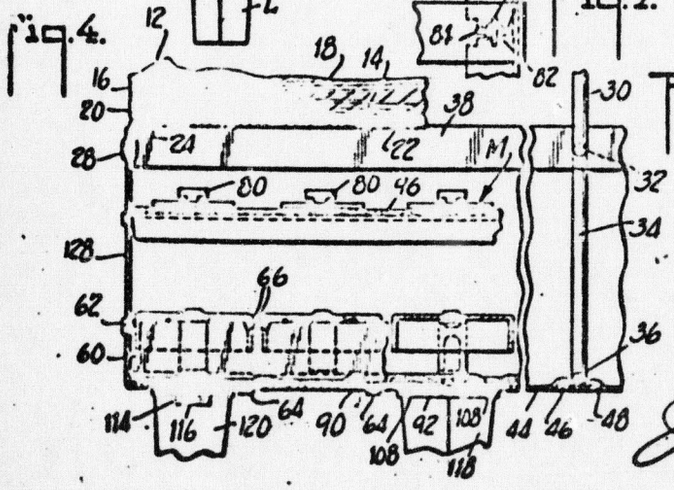
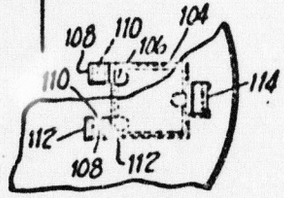


Fig. 5.



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UNITED STATES PATENT OFFICE

2,279,143

TOY PIANO

Raymond J. Lohr, Erie, Pa., assignor to Louis Marx & Company, Inc., New York, N. Y., a corporation of New York

Application August 15, 1939, Serial No. 290,208

13 Claims. (Cl. 84—104)

...invention relates to toys, and particularly ...anos.

...anos are already known in which keys ...d to strike a xylophone having metallic ...r plates, perhaps more properly termed ...ophone. The primary object of my in...n is to generally improve toy pianos of this ...r. A more particular object is to pro... ...y piano which is made almost wholly of ...t which sounds fully as good as, or even ...than, a toy piano made of wood.

...r object of my invention is to provide ...oved and greatly simplified "action" be... the keys and the metallophone, this ac...ing so simplified as to completely elimi... the usual intermediate levers, and the like.

...ther object is to improve the pivoting ...ys, and to provide a frictionless and in... mounting making it very easy to as... the keys in the piano during manufac... These objects all contribute to make pos... cost manufacture of the toy piano.

...er object of the invention is to provide ...no with a book-top preferably containing ...own children's songs in simplified nota... notes and keys preferably having cor...ing numbers to facilitate playing of the ...by an untrained child. The book-top is a ...d piano top which may preferably be ...to conform in outline to the configuration ...ape of the piano, and which is pivoted so ...t may be raised to a position which facili...ding the music therein. The piano may ...provided with a pivotally mounted sup... which is adapted when in raised position ...d the book-top in its position of use, the ...ment being such that the support and ...k-top may be folded down flat on top of ...no when not in use.

...book-top construction is not claimed here... ...ing claimed in my co-pending divisional ...tion Serial No. 393,766, filed June 19, 1941, ...titled "Toy piano."

...the accomplishment of the foregoing, and ...ther objects as will hereinafter appear, ...ention consists in the toy piano elements ...their relation one to the other, as herein... ...are more particularly described in the ...ation, and sought to be defined in the ...

The specification is accompanied by a ...in which:

...is a perspective view of the piano with ...top in closed position;

...is a perspective view with the book-top ...position;

Fig. 3 is a section taken in elevation through the piano in the plane of the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary transverse section across the front of the piano taken in the plane of the line 4—4 of Fig. 3;

Fig. 5 is a horizontal section over the top of one of the folding piano legs, and is taken in the plane of the line 5—5 of Fig. 3;

Fig. 6 is a perspective view showing the construction of one of the keys with attached hammer; and

Fig. 7 is explanatory of a detail of the metallophone construction.

Referring to the drawing, and more particularly to Fig. 1, the piano, in the specific example here illustrated, simulates a grand or baby grand piano. It comprises a case C supported on legs L, and having a row of keys K at the front of the piano. The piano is provided with a top T which preferably conforms, in outline, to the configuration of the piano case. This top is, in reality, a book of music or songs. The top is pivoted at the front of the case and may be raised and supported in an angular position, such as that illustrated in Fig. 2. The book-top may then be opened to expose any one of the series of pages of music or songs therein.

Considering the construction in greater detail, and referring to the remaining figures of the drawing, the book-top comprises a front cover 12 and a back cover 14 which are preferably made of a single piece of cardboard folded at the middle to form a binding portion 16 at the left-hand edge of the book. A series of pages 18 are bound into the book, these preferably also being folded at the middle, and the assembly being stitched, stapled, or otherwise secured, in accordance with methods well known to binders. The book cover is free at the right-hand edge. The cover is slit at the binding for a short distance, thus also freeing the back cover at the lower end of the left-hand edge. These free edges are clamped by reversely folded flanges 20 at the ends of a mounting wall 22. The mounting wall extends across the piano from one side to the other, and may be a narrow strip, as shown, if the back cover 14 is stiff enough to be self-sustaining in shape. If the cover of the book is made of light material, the mounting wall 22 is preferably extended upwardly or widened to better support the book, and the left-hand edge of the book may be clamped at the top as well as at the bottom. The lower edge of mounting wall 22 is preferably flanged forwardly, as is indicated at 23, in order to provide a positive stop at the bottom edge of

the book. The ends of mounting wall 22 are provided with integrally formed bearing ears 24 which are turned downwardly and pivoted to the side walls of the piano case, as by means of the eyelets 28. It will be evident that with this construction, the mounting wall 22, and with it the book-top T, may be folded down flat on top of the piano case, as shown in Fig. 1, or may be turned upwardly, as is indicated in Fig. 2.

When the book-top is turned upwardly, it is supported in raised position, by means of a suitable top support. In the present case the support is a piece of wire 30, which is extended horizontally rearwardly at 32, then downwardly at 34, and then again bent horizontally at 36. The horizontal portion 32 acts as a pivot, it being received in a hole through a flange 38 on the top wall 42 of the piano case, and also being received in a bearing ear 40 which is struck downwardly from the top wall 42. The portions 34 and 36 of support 30 are not essential, but are preferably added in order to provide detent means to hold the support 30 in upright position. Specifically, the part 36 bears against the bottom wall 44 of the piano case when the support 30 is in upright position. Referring to Fig. 4, it will be seen that bottom wall 44 is indented at 46 and 48 to form a detent which receives the part 36. Inasmuch as the bottom 44 of the piano case is somewhat resilient, it yields downwardly when the part 36 is forced between the indentations 46 and 48. It will be understood that the support 30 may be turned sidewardly to a horizontal position, the part 36 then being moved out of locking engagement with the bottom of the case and rising until it rests against the top wall 42. At this time the support 30 is in horizontal position and lies below the level of top wall 42, and therefore does not interfere with folding of the book-top flat against the top of the piano case.

The mechanism or "action" of the piano is extremely simple. The keys K are short and are pivoted near their rear ends. The short rearward extensions 50 (Figs. 3 and 6) of the keys have strips of material 52 secured thereto. The strips are preferably long, slender springs in strip or ribbon form, and each has a hammer head 54 at its rear end. The hammer head 54 is preferably made of a short piece of metal rod, the upper end of which is rounded, and the lower end of which is necked and riveted through a hole in the end of the spring. This provides a slightly weighty, upwardly directed hammer. The metallophone, generally designated M, extends across the piano from one side to the other and is disposed at a level higher than the row of keys K. The metallophone plates are located over the hammers, and it will be evident from inspection of Fig. 3, that on depressing any one of the keys the hammer 54 will be raised to strike the corresponding metallophone plate, as is indicated by the change in position from 52, 54 to 52', 54'. Because of the extremely light, springy nature of the springs 52, there is no interference with proper vibration of the metallophone plate, even if the key is held in depressed position. The keys K are preferably formed of sheet metal. Each key is made of a single piece of sheet metal which is bent downwardly at its edges to form a hollow key which is open at the bottom. The side edges 56 (Fig. 6) are upwardly notched at 58 to fit over a fulcrum strip 60 (Fig. 3) which extends from one side of the piano to the other. The fulcrum strip 60 is preferably L-shaped in section, and is secured in position by tongue and slot connections 62 at its ends which pass through the side walls of the piano case. It may preferably is additionally secured in position by plurality of tongue and slot connections at the bottom of the piano case, one being indicated at 64 in Fig. 3.

The fulcrum strip 60 is preferably slightly along its upper edge, as is indicated in Fig. 4. These notches may be formed, desirable to locate the keys against movement and to space the same apart. The keys are held on the fulcrum by a retainer strip 68, best shown in Fig. lower edge of said strip being disposed over the upper edge of fulcrum strip 60, upper edge of retainer strip 68 may be rearwardly at 70 to stiffen the same and the piano a more finished appearance. The tainer strip is secured in position by tongue slot connections 72 at the ends of the piano tongues 72 passing through the side walls piano case. If desired, the lower edge of er strip 68 may be provided with a cushioning material 74, this preferably being of small diameter tubular material which gitudinally slit to be received over the lower of the retainer strip. The material may be ber coated fabric, such as the so-called ghetti" often used for electric insulating poses.

The metallophone itself is generally conventional, but the manner in which the metallophone plates are supported deserves mention. The plates are supported on two diverging as is conventional, but these strips are in present case formed of sheet metal which to L-shaped configuration with the horizontal part on top, as is best shown at 76 in Fig. The ends of these strips are secured between side walls of the piano case by appropriate and slot connections 78. A series of T-shaped lugs 80 are struck upwardly from the strip as is best shown in Figs. 3, 4 and 7. The shaped lugs 80 are received in holes 82 through the ends of the metallophone these holes having slots 84 which are dimensioned to receive the T-shaped lugs 80, but are normally disposed perpendicular to shaped lugs. Thus, the metallophone is initially assembled by twisting the lugs following which the plates are held loosely, should be, but are incapable of falling out sition if the piano is turned upside down. lugs need be twisted at only one end, for other end the entire plate may be oriented receive the lug.

The forward ends of spring 52 are prosecured to the keys in the following manner. rear end wall 86 (Fig. 6) of each key is to receive the spring 52, and the top wall forated to receive an eyelet 88. The end spring is passed through the slot into the interior of the key, and is then eyeletted the top wall of the key by means of the

Inasmuch as the piano is made of sheet metal, it is desirable to provide buffer strips made of fibrous material, fabric or felt. One such strip of material indicated at 90 in Figs. 3 and 4, this tending beneath the keys and prevents metallic sound resulting from the lower the key striking the bottom of the piano other such strip is indicated at 92 in Fig. 4, this strip extending over the bottom piano beneath the hammer 54. The

...place by a number of tongues 94 which ...ck upwardly from the bottom 44 of the ...strip 92 acts as a cushion and sound ...g medium to prevent any metallic sound ...piano key is released and the hammer ...inst the bottom of the piano. Finally, ...8 are preferably disposed on top of the ...tone supports 76. These may consist ...f heavy strands of wool yarn which are ...g the tops of the strips.

...s L, of the piano, are preferably ar... to fold up against the bottom of the ...r more compact packaging, this being ...r of greater convenience during storage ...ment of the toy. Referring to Fig. 3, ... is formed of a main piece of sheet metal ...longitudinally folded four times to form ...g of square section. The seam, where ... of the metal meet, is preferably dis... the inside of the leg, as is indicated at ...r. 3. At its lower end, extensions of the ...are turned inwardly, as is indicated at ...artially close the bottom end of the leg. ...per end the leg is secured to a small ...104, the parts being attached by means ...tongue and slot connections 106. Top ...is provided with a pair of extensions ...s 108 (Fig. 5) which are bent or curled ...hinge sleeves. These are received on ...ins 110 which are formed by providing ...om 44 of the piano with a pair of closely ...collateral slots 112. The material, be... slots 112, acts as the hinge pin 110. At ...site end the top plate 104 is provided ...other extension or tongue 114 which is so ...as to act as a spring detent. It cooper... a guide lug 116 struck downwardly ... bottom 44 of the piano. It will be ...en study of the drawing, that with this ...tion the legs may be folded inwardly ...solid line position to the broken line ...116".

...s are preferably so mounted as to be ...in different directions. For example, the ... 118 may fold forwardly, as shown at ...ile the front legs may fold sidewardly ... toward one another. In the present ...rear leg 118 folds forwardly and the ... 120 folds rearwardly, while the front ...olds sidewardly, as is indicated by the ...g. Fig. 2. This folding of the legs in dif...direction is not at all essential, but is ...t desirable in order to help add sta...when the legs are in use. The legs, of ...clear one another when folded and thus ...e the size of the carton needed to box ...

...case of the piano may be assembled out ... of sheet metal patterned in a number of ...t I prefer the method of assembly here ...d. The bottom 44 is a single, large ... sheet metal, the front edge of which is ...wardly at 124 (Fig. 3) and rearwardly ...to form a suitable ledge at the keyboard. ...om 44 is provided with extensions at its ...ich are folded upwardly to form the ... side walls 128 and 130. These are ...g turned inwardly at the top to form ...131. The curved or contoured rear edge ...wall 44 is flanged upwardly for a short ...132, as is shown in Fig. 3.

...r wall of the piano consists of a sepa... of sheet metal 134 which is readily ...the desired curved outline. It is secured ...n wall 44 within flange 132 by appropriate bent tongue and slot connections, one of which is indicated at 136. Its ends are secured to the side walls 128 and 130 by bent tongue and slot connections 138. The case is completed by the top wall 42, the curved periphery of which is downwardly flanged at 140. The top wall is secured to the side wall 134 by bent tongue and slot connections 142. The top wall 42 preferably terminates well behind the front edge of the piano in order to provide plenty of room for sound egress. In the present case, it terminates at the flange 38 which is disposed approximately over the middle of the metallophone. The key retaining strip 68, which finishes the front of the piano case, has already been described.

It is believed that the construction and operation, as well as the many advantages of my improved toy piano will be apparent from the foregoing detailed description thereof. It will also be apparent that while I have shown and described my invention in a preferred form, many changes and modifications may be made in the structure disclosed without departing from the spirit of the invention as sought to be defined in the following claims.

In the claims the term "metallophone" is intended to also include a xylophone and like equivalents. The reference in some claims to the piano case simulating a "baby grand piano" is intended to include a simulation of a grand piano and intermediate variations.

I claim:

1. A toy piano comprising a row of simulated piano keys, a metallophone extending across said piano, a slender spring wire secured directly to each key, a hammer head at the end of each spring wire, the parts being so arranged that depression of a key causes the hammer to strike a corresponding metallophone plate.

2. A toy piano comprising a case, a keyboard including a row of pivoted simulated piano keys at the front of said case, a metallophone extending across said piano from side to side at a level higher than the keyboard, a strip of material secured directly to and extending rearwardly from each key to a point beneath the metallophone, and a hammer head at the end of each strip, whereby depression of a key causes the hammer to rise and strike a corresponding metallophone plate.

3. A toy piano comprising a case simulating a baby grand piano, a keyboard including a row of pivoted simulated piano keys at the front of said case, a metallophone extending across said piano from side to side at a level higher than the keyboard, a slender leaf spring secured directly to and extending rearwardly from each key to a point beneath the metallophone, and an upwardly pointed metallic hammer head at the end of each spring, said spring and head constituting a hammer, whereby depression of a key causes the hammer to strike a corresponding metallophone plate, said key being restored by the weight of the hammer.

4. A toy piano comprising a row of simulated keys, a fulcrum strip for the keys extending from one side of the piano to the other, each key being notched upwardly to fit around the upper edge of the fulcrum strip, and a continuous retainer strip above the keys to hold the keys on the fulcrum strip.

5. A toy piano comprising a row of simulated keys, each key being a hollow sheet metal part which is open downwardly, a fulcrum strip for

the keys extending from one side of the piano to the other, the longitudinal or side walls of each key being notched upwardly to fit around the upper edge of the fulcrum strip, a retainer strip extending from one side of the piano to the other directly above said keys, said retainer strip functioning to hold the keys on the fulcrum strip.

6. A toy piano comprising a piano case, a keyboard at the front of the piano comprising a row of simulated keys, each key being a hollow sheet metal part which is open downwardly, a fulcrum strip for the keys extending from one side of the piano to the other, the longitudinal or side walls of each key being notched upwardly to fit around the upper edge of the fulcrum strip, the top edge of the fulcrum strip being notched to hold the keys against sideward movement, a retainer strip extending from one side of the piano to the other directly above said keys with its lower edge in substantially the same plane as the fulcrum strip, said retainer strip functioning to hold the keys on the fulcrum strip.

7. A toy piano comprising a piano case, a keyboard at the front of the piano comprising a row of simulated keys, a fulcrum strip for the keys extending from one side of the piano to the other, each key being notched upwardly to fit around the upper edge of the fulcrum strip, a retainer strip extending from one side of the piano to the other directly above said keys, said retainer strip functioning to hold the keys on the fulcrum strip, a metallophone extending across said piano from side to side at a level higher than the keyboard, a strip of material secured directly to and extending rearwardly from each key, and a hammer head on each strip, whereby depression of a key causes the hammer to strike a corresponding metallophone plate.

8. A toy piano comprising a piano case, a keyboard at the front of the piano comprising a row of simulated keys, each key being a hollow sheet metal part which is open downwardly, a fulcrum strip for the keys extending from one side of the piano to the other, the longitudinal or side walls of each key being notched upwardly to fit around the upper edge of the fulcrum strip, a retainer strip extending from one side of the piano to the other directly above said keys, said retainer strip functioning to hold the keys on the fulcrum strip, a metallophone extending across said piano from side to side at a level higher than the keyboard, a slender leaf spring secured to and extending rearwardly from each key to a point beneath the metallophone, and an upwardly pointed metallic hammer head at the end of each spring, said spring and head constituting a hammer, whereby depression of a key causes the hammer to strike a corresponding metallophone plate, said key being restored by the weight of the hammer.

9. A toy piano comprising a piano case made of sheet metal and simulating a baby grand piano, a metallophone extending across the inside of said case, a row of simulated piano keys with associated mechanism to strike the metallophone, said case comprising a single large piece of metal bent upwardly and then rearwardly at the front edge to form a ledge at the keyboard, a piece having a narrow edge flange bent [illegible] a strip of sheet metal bent to form the [illegible] of the case, and a cover wall secured at [illegible] of said rear wall.

10. A toy piano comprising a piano case of sheet metal, a metallophone support strip extending from one side wall to the other, said strip having a series of lugs struck upwardly therefrom, a series of metallophone plates extending across said strip and having holes to loosely receive said lugs.

11. A toy piano comprising a piano case of sheet metal and simulating a baby grand piano, said case comprising a single [illegible] of sheet metal bent upwardly and then rearwardly at the front edge to form a ledge for a keyboard, a strip of sheet metal bent to the rear edge of the case, a cover wall [illegible] the top of said rear, a fulcrum strip extending from one side wall to the other beneath the keyboard, a retainer strip extending from one side wall to the other above the keys and fulcrum strip, a metallophone support strip extending from side wall to the other, said strip having a series of lugs struck upwardly therefrom, a series of metallophone plates extending across said strip and having holes which loosely receive the lugs.

12. A toy piano comprising a case simulating a baby grand piano, a keyboard including a row of pivoted simulated piano keys at the front of said case, a metallophone extending across the piano from side to side at a level higher than the keyboard, a strip of material secured directly to and extending rearwardly from each key to a point beneath the metallophone, and a rearwardly pointed hammer head at the end of each strip, said strip and head constituting a hammer, whereby depression of a key causes the hammer to strike a corresponding metallophone plate, said key being restored by the weight of the hammer.

13. A toy piano comprising a piano case, a keyboard at the front of the piano comprising a row of simulated keys, each key being a hollow sheet metal part which is open downwardly, a fulcrum strip for the keys extending from one side of the piano to the other, the longitudinal or side walls of each key being notched upwardly to fit around the upper edge of the fulcrum strip, a retainer strip extending from one side of the piano to the other directly above said keys, said retainer strip functioning to hold the keys on the fulcrum strip, a metallophone extending across said piano from side to side at a level higher than the keyboard, a strip of material secured directly to and extending rearwardly from each key to a point beneath the metallophone, and an upwardly pointed hammer head at the end of each said strip and head constituting a hammer, whereby depression of a key causes the hammer to strike a corresponding metallophone plate, said key being restored by the weight of the hammer.

RAYMOND J. [illegible]

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ELECTRICAL PIANO

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Fig. 1.

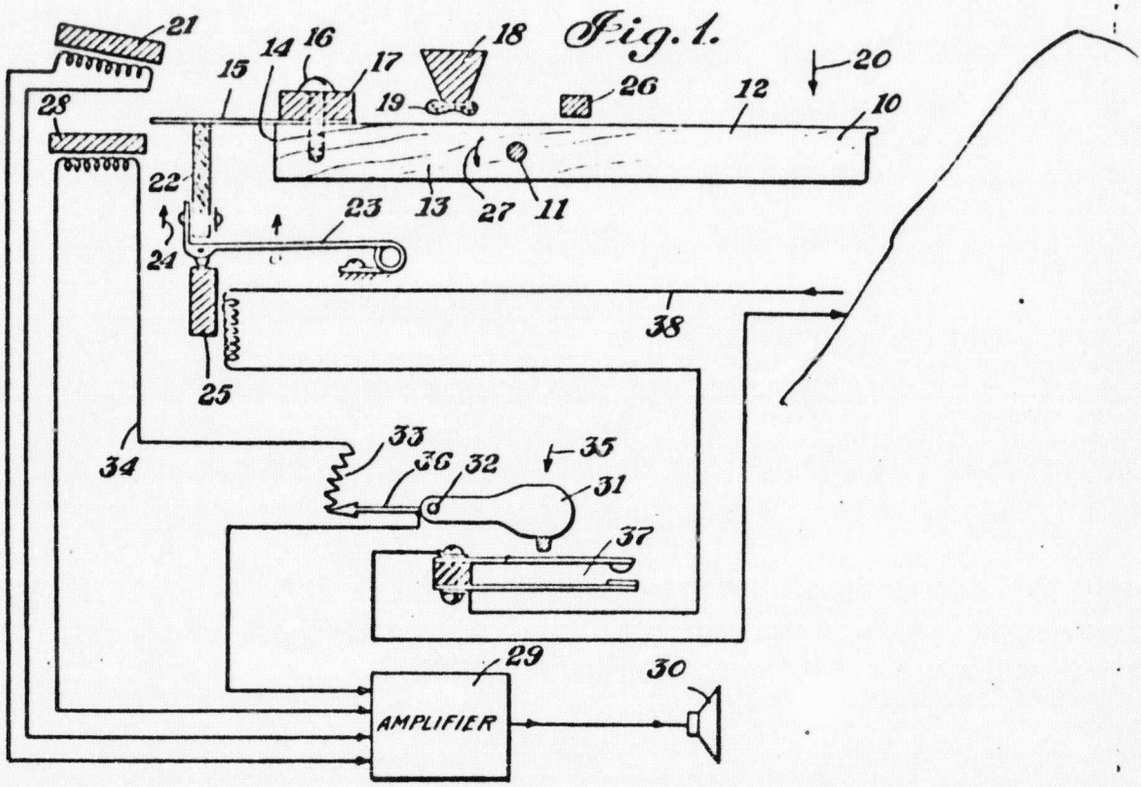
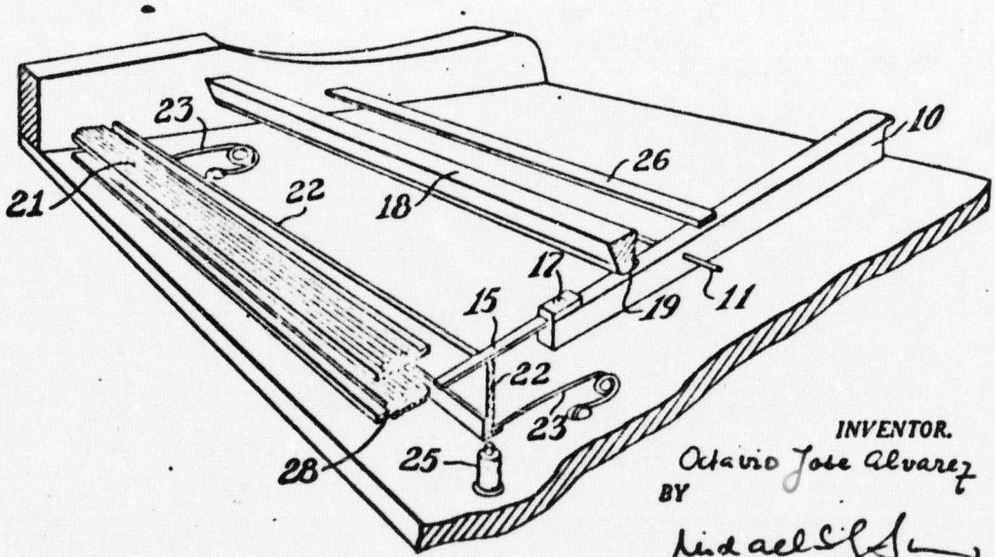


Fig. 2.



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ELECTRICAL PIANO

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Fig. 3.

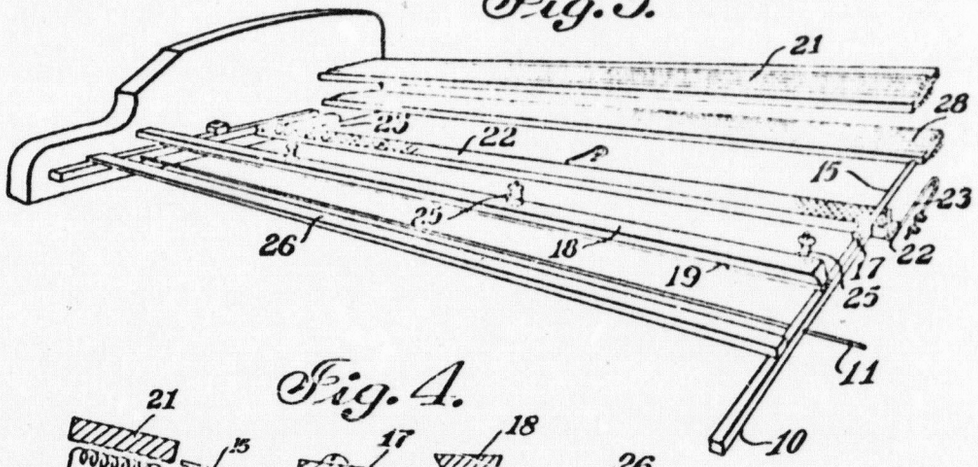

Fig. 4.

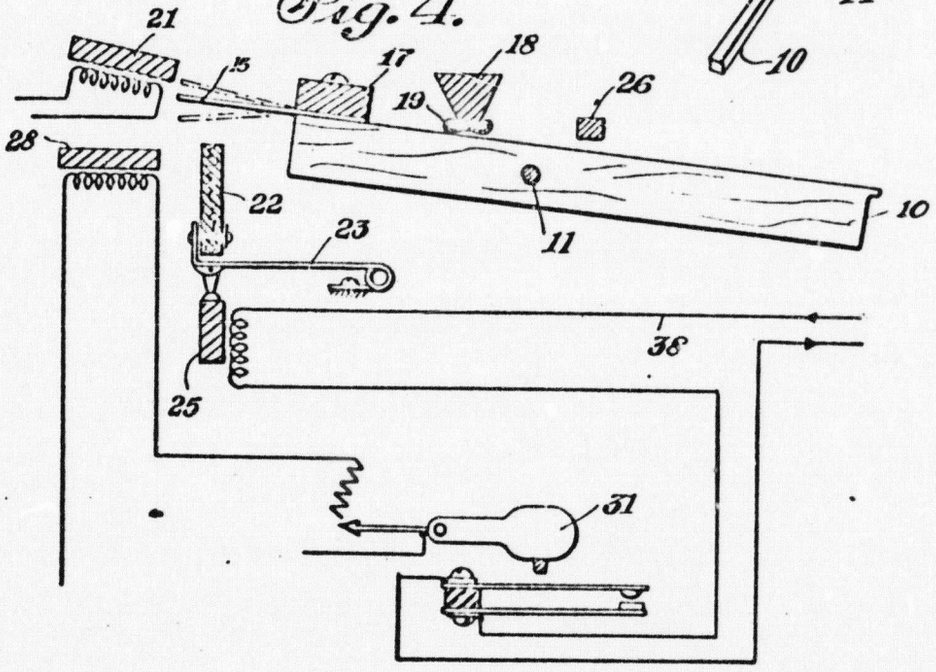

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Fig. 5.

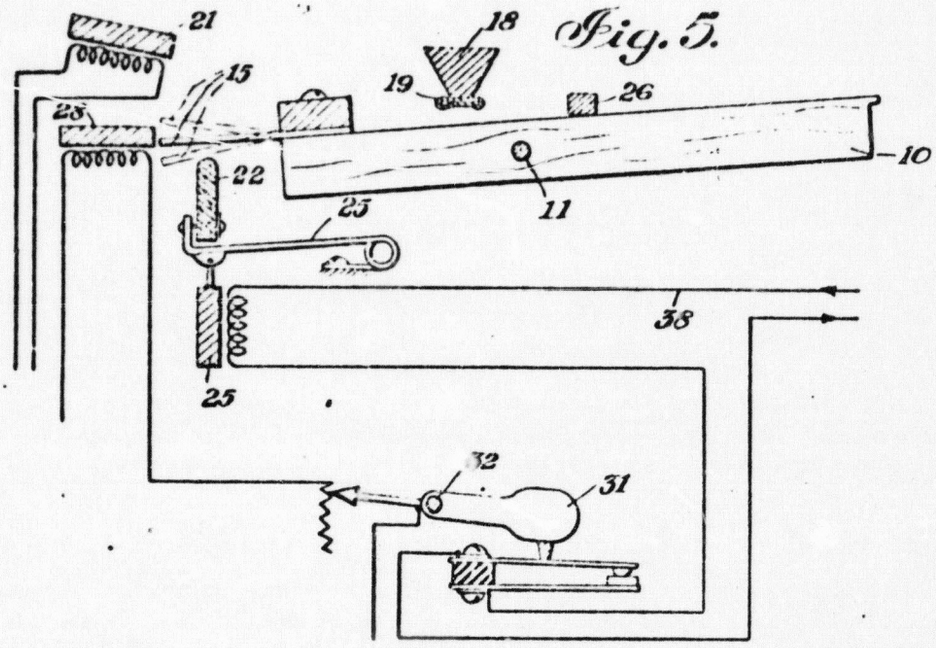

Fig. 6.

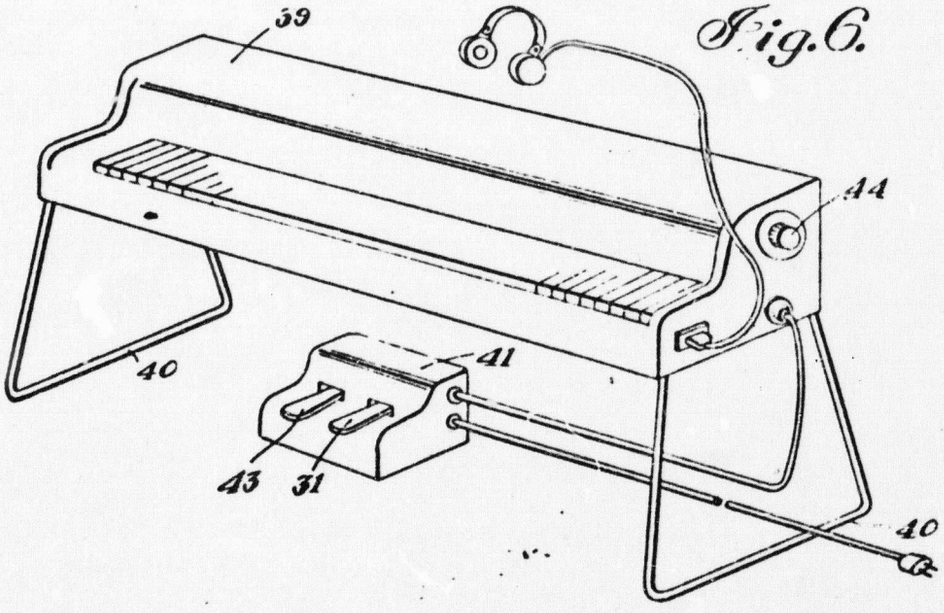

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Fig. 7.

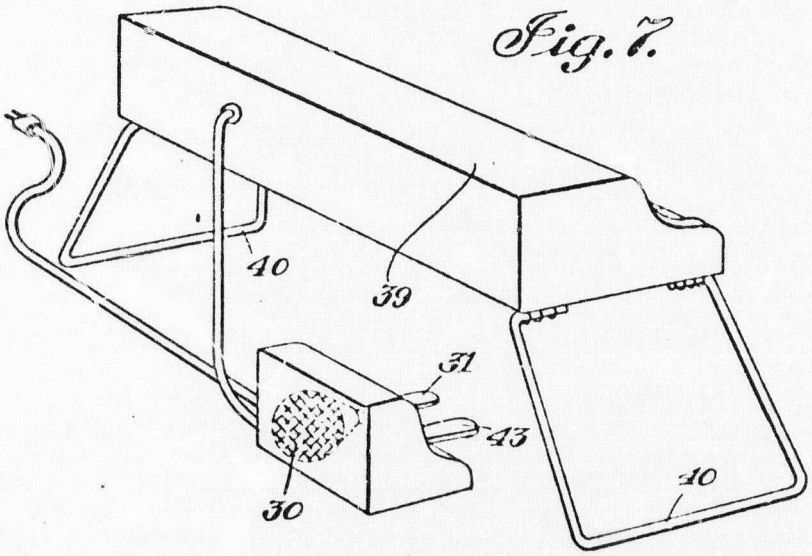
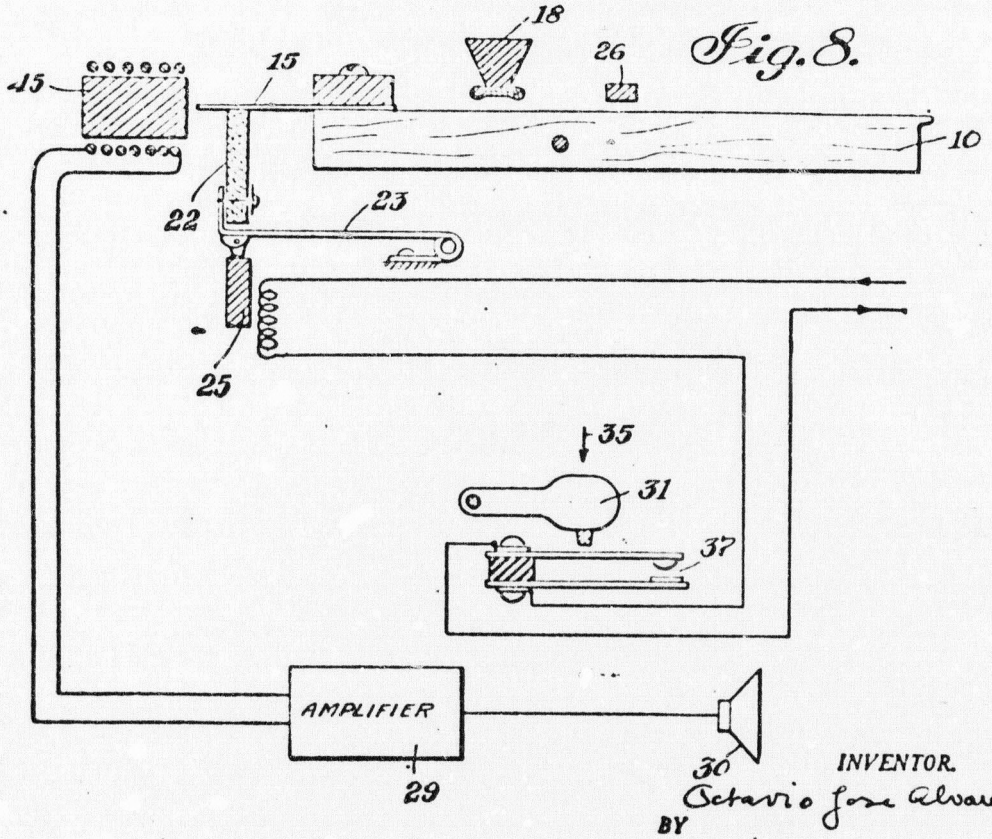


Fig. 8.



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UNITED STATES PATENT OFFICE

2,486,545

ELECTRICAL PIANO

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Application May 22, 1946, Serial No. 671,587

21 Claims. (Cl. 84—1.15)

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My present invention relates to musical instruments and more particularly to electrical instruments of the piano type.

It is an object of my present invention to provide an electrical musical instrument which is extremely simple in construction and nevertheless, has a touch which is very similar to the one of a piano of usual type. Also the music obtained from an electrical musical instrument of this type is very similar in tonal quality to the music obtainable with a conventional mechanical piano.

It is a further object of my present invention to provide a musical instrument of the above type which is equipped with a conventional keyboard and pedals adapted to be operated like those of a conventional piano.

With the above objects in view, my present invention mainly consists of an electrical musical like instrument comprising in combination a series of vibration creating units each of which consists of a magnetized steel reed, a turnable holding member to which this magnetized steel reed is secured so as to be adapted to vibrate relative to this holding member, and a stop member arranged so as to be adapted to stop turning of the holding member after the same has been turned by said operating member.

An electrical musical instrument of the type proposed above comprises in addition to the described vibration creating units an electric vibration pick-up arrangement arranged so that the reeds secured to the holding members are turnable between two positions in one of which they are near to the pick-up arrangement and in the other of which they are farther therefrom.

In an instrument of the type described the various tones are preferably obtained by making the reeds of different lengths. When an operating member is moved the corresponding holding member will turn until it abuts against the stop member; thus, this stop member will abruptly terminate turning movement of the holding member thereby causing vibration of the reed secured to the same. Such vibration of the reed will be picked up by the electrical vibration pick-up arrangement and transformed in well-known way into sound vibrations which are transmitted therefrom by a loud speaker of conventional type.

In accordance with a preferred embodiment of my present invention, an electrical piano embodying the above described elements and features comprises a common electric vibration pick-up arrangement and a series of vibration creating units; each of these vibration creating units comprises a piano key consisting of an outer operating key portion and an inner supporting key portion, a vibratable magnetized steel reed secured to this inner supporting key portion at the outer end thereof in such a manner as to enable vibration of the reed relative to the key, common

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pivoting means turnably supporting all piano keys so that each of them is turnable between inoperative position in which the reed secured to the key is relatively far from the common pick-up arrangement and operative position in which the reed is relatively near to the common pick-up arrangement within the pick-up sphere of the same, and a common slightly resilient stop member arranged in the path of turning of all piano keys so as to abruptly stop turning of a key when the same is turned by its outer operating portion from inoperative into operative position; and abrupt stopping of the key in turn will result in vibration of the reed secured thereto.

Of course, a piano of the type proposed by me might also be provided with a so-called loud pedal and a so-called soft pedal which are simply combined with the electrical amplifier and loud speaker actuated by the electric vibration pick-up arrangement mentioned above. Of course, it is also possible to obtain with one single pedal both effects.

In addition to these pedals, it is of course, also necessary to have a sustaining pedal by which it is possible to sustain or draw out the tones created by depressing the keys.

In order to obtain this sustaining effect I provide in accordance with a preferred embodiment of my present invention a second electric vibration pick-up arrangement arranged spaced from the first electric vibration pick-up arrangement described above; the keys and their pivoting means are then arranged so that each of the keys is turnable between a first position in which the reed secured to the key is located near the first pick-up arrangement and a second position in which it is located near the second pick-up arrangement.

If a second pick-up arrangement is provided as described in the preceding paragraph, the slightly resilient stop member, preferably called first stop member, is arranged so as to stop movement of a key when depressed in the above mentioned first position, namely in a position in which the reed secured to the key is located near the first pick-up arrangement. Furthermore, I provide also a second stop member which is arranged movably into the path of the reeds themselves so as to stop vibration of the same after the keys have been depressed and released thereafter. Finally, I provide also a third stop member arranged in the path of the keys so as to stop the same when the reeds secured thereto are located near the second pick-up arrangement mentioned above.

The pedal which creates a sustaining tone effect is electrically connected with the second stop member and adapted to move the same out of the path of the keys and the reeds secured thereto when a sustained tone effect is desired.

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By such action of the pedal the key or keys are free to move when released until the reed or reeds secured to them are located opposite the above mentioned second pick-up arrangement which will transform the continuing vibrations of the reeds into sustained tone effects reproduced by the loud speaker arrangement mentioned above.

The novel features which I consider as characteristic for my invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a schematic diagrammatic side view, partly in sections, of an electrical piano of the type proposed by me;

Fig. 2 is a perspective rear view of the piano schematically and diagrammatically shown in Fig. 1, partly in sections;

Fig. 3 is a perspective front view of the piano shown in Figs. 1 and 2, partly in sections;

Fig. 4 is a schematic diagrammatic side view of my new piano similar to the view shown in Fig. 1, showing a key in depressed position;

Fig. 5 is a view similar to the one in Figs. 1 and 4, showing the sustaining pedal in depressed operative position;

Fig. 6 is a perspective outer front view of an electrical piano of the type shown in Figs. 1 to 3;

Fig. 7 is a perspective outer rear view of the same piano; and

Fig. 8 is a diagrammatic, schematic side view, partly in section, of a modified embodiment of a piano of the type proposed by me.

As shown in Figs. 1 to 3, my new piano comprises a series of piano keys 10 all of which are pivoted on a common pivoting rod 11. Each of the keys 10 consists of an outer operating key portion 12 and an inner supporting key portion 13.

In accordance with my present invention I secure to the inner end 14 of each of the keys 10 a reed 15 which is freely vibratable and consists of a steel band or like member as clearly shown in Figs. 2 and 3.

I wish to mention that for purposes of clarity I have shown in Figs. 2 and 3 only one single key; of course, there are in a piano the usual number of keys; however, I have omitted them in order to facilitate showing of the construction details of a key. All keys are equal in construction; the only difference is that the reeds are differently shaped, e. g. of different lengths so as to create different vibrations and thus cause different tones.

Reed 15 mentioned above is secured to the inner end 14 of the supporting portion 13 by means of screw 16 and the magnetized steel block 17.

I arrange in the path of the key itself three stop members: A first stop member consisting of a rod 18 to which the slightly resilient tubular member 19 made of a plastic material and having a substantially elliptical cross section is secured. This first stop member which, as shown in Figs. 2 and 3 cooperates with all the keys is arranged so that when one of the keys 10 is depressed at its operating portion 12 in direction of arrow 20 the key moves into the position shown in Fig. 4 abutting against the plastic tubular member 19 at the moment when reed 15 is located at least substantially opposite and near the common electrical vibration first pick-up arrangement, i. e. first pick-up coil 21.

In addition to this first stop member I vide a second movable stop member which sists of a band-shaped piece 22 of felt o resilient material, arranged as shown in drawings. This second stop member is mo supported by the spring supports 23 tendi move it from its position shown in Fig. 5, in d tion of arrow 24 into its position shown in F The spring supports 23 are combined with noid arrangements 25 of well-known type ad when energized to move the second stop me 22 against action of spring support 23 fro position shown in Fig. 1 into the position s in Fig. 5.

Finally, I arrange in the path of the ke a common third stop member which cons a bar 26 arranged in such a manner as t turning movement of the keys in direction o row 27 when the second stop member 22 a retracted position shown in Fig. 5. It sho stressed that this stop member 26 has to b cated so that in the position shown in Fig. non-depressed keys 10 are located near the ond electric vibration pick-up arrangement near the pedal pick-up coil 23.

Although evident, it should be noted th keys 10 are supported by the pivoting bar such a manner that each of them has a ten to turn in direction of arrow 27, i. e. to a automatically from the depressed position s in Fig. 4 into one of the positions shown in 1 and 5.

Both the main pick-up coils 21 as well a pedal pick-up coil 23 are connected in well-k manner with the amplifier 29 and loud speak

In order to properly operate the pedal pi coil 23 and to synchronize it with the move of the second stop member 22 described a the pedal 31 is turnably supported by piv and electrically connected on the one hand pick-up coil 23 and on the other hand wi solenoids 25 serving for retracting the stop ber 22.

The electrical connection between pedal 3 the pick-up coil 23 consists of the combin sistor switch arrangement 33 included in ductor 34 connecting the pick-up coil 23 amplifier 29. This combined resistor swit rangement 33 is constructed so that in th operative position of the pedal 31 shown in the connection between the pick-up coil 2 the amplifier 29 is interrupted.

If the pedal is pressed down in direct arrow 35, e. g. into the position shown in F the turnable switch arm 36 forming part switch resistor 33 will contact the resisto ment and establish contact between the p coil 28 and amplifier 29.

The resistor effect of resistor 33 upon th trical vibrations transmitted from pick-up to amplifier 29 will depend upon the de which the pedal is pressed down: If the pe is pressed down slightly all windings of the tor 33 will be included in conductor 34 w pedal 31 is entirely pressed down actually sistor winding will be interposed between p coil 28 and amplifier 29.

Pressing down of pedal 31 results also in c of switch 37 included in circuit 38 of the noids 25. Thus, by pressing down of the 31 the solenoids 25 will be energized wh sults in a downward movement of the s cores together with the stop member 22 to they are secured from the position sho Fig. 1, into the position shown in Fig. 5.

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My new piano described above in detail operates as follows:

In inoperative position the pedal 31 and keys 10 are in the position shown in Fig. 1, i. e. the reeds 15 are supported by stop member 22 and the resistor 33 and switch 37 operated by pedal 31 are open.

In order to create a tone, one of the keys, e. g. key 10 shown in Fig. 7 is depressed in direction of arrow 20. This results in upward turning movement of the inner supporting key portion 13 until the same abuts against the resilient tubular stop member 19. This creates a certain impact resulting in vibration of the abruptly stopped reed 15.

At this moment the key 10 and the reed 15 are in the position shown in Fig. 4, i. e. reed 15 is located near the main pick-up coil 21. In this position the vibration of the reed 15 will be picked up by the coil 21, transformed into electrical vibrations which, after amplification by means of amplifier 29 are transformed into audible sound waves by means of the loud speaker 30.

As stated above, the reeds 15 are differently shaped so that vibration of each reed will create a different audible tone. In this connection it should be stressed that if several keys are depressed simultaneously the created vibrations will not interfere with each other; to the contrary, each of the vibrations will be transformed into corresponding electrical vibrations, amplified separately and reproduced by the load speaker independently from other vibrations. Thus, a musical accord created by depressing several keys will sound on an electrical piano of the above type the same as on a conventional hammer type piano.

If the pedal 31 is in the position shown in Fig. 1 and key 10 is released from its position shown in Fig. 4 after having been depressed and having created a tone as described above, it will automatically return into its position shown in Fig. 1. During such movement reed 15 will abut against the stop member 22 which will block further vibration of the reed. Thus, release of the key 10 will result in turning of the same into the position shown in Fig. 1 and termination of vibration of the reed 15, which in turn will abruptly terminate the tone reproduced by loud speaker 30.

In order to sustain the tone after release of one or more keys it is necessary to depress pedal 31 in direction of arrow 35 into the position shown in Fig. 5. In this position switch 37 is closed and the solenoids 25 are energized, moving the stop member 22 out of the path of the reed 15. Simultaneously, depression of pedal 31 results in closing of the resistor switch 33 and operative connection between the pedal pick-up coil 28 and amplifier 29.

Thus if key 10 is released after pedal 31 has been depressed it will turn due to its own weight into the position shown in Fig. 5, i. e. into a position in which the operating portion 12 of key 10 abuts against the third stop member, i. e. against the stop bar 26. In this position, the reed 15 will be opposite the pedal pick-up coil 28 and the undampened vibrations of the reed will influence this coil and create in the same electrical vibrations which then are transformed in well-known way by means of amplifier 29 and loud speaker 30 into audible tones.

I wish to stress the important fact that stopping of the turning movement of key 10 in direction of arrow 27 by means of the stop rod 26 does not result in termination or dampening of the vibrations of reed 15 after such vibrations have been created by abutment of key 10 against the tubular stop member 19. Vibrations of the reeds 15 can be stopped only by the stop member 22 if the same contacts the reeds 15 directly as shown in Fig. 1.

In order to terminate the sustaining effect of pedal 31 it is only necessary to release the same, i. e. to permit the pedal 31 to turn from its position shown in Fig. 5 into the position shown in Fig. 1. Such turning movement of the pedal is caused by spring means of usual type not shown in the drawings.

Return of the pedal 31 into the position shown in Fig. 1 will result in opening of the resistor switch 33 and of the switch 37. This in turn will disconnect the pedal pick-up coil from amplifier 29 and simultaneously interrupt the circuit 30 energizing the solenoids 25. Thereby the stop member 22 will be released and moved by means of the springs 23 in direction of arrow 24 until it contacts reed 15 stopping vibration of the same as shown in Fig. 1.

In Figs. 6 and 7, I have shown the general arrangement of a preferred embodiment of a piano of the above described type. In this embodiment all keys, reeds, the various stop members and both pick-up coils are arranged in the piano case 39 which, due to the fact that it is not needed as a vibratable resonance element can be made relatively small and light. The supporting legs 40 are turnably attached to the piano case 39 so that they might be folded under the same.

The pedal casing 41 contains the pedals and the various switch means described above together with the loud speaker 30 as shown in Fig. 7. The amplifier 29 might be arranged either in the piano case 39 or the pedal casing 41. As clearly shown in Figs. 6 and 7, I preferably construct the pedal casing 41 so that it has the same cross section as the piano case 39; this facilitates transportation and storage of the same.

Furthermore, I might combine with the piano a set of earphones 42 and a switch for disconnecting the loud speaker 30 so as to enable hearing of the music produced only by means of the earphones whenever desired.

I have shown in Figs. 6 and 7, two pedals: One of these pedals, namely sustaining pedal 31 operates as described above. The other pedal 43 serves as combined loud and soft pedal and is connected with a resistor not shown in the drawings for regulating the volume of the reproduced music. In addition to pedal 43 I might provide another hand operated volume control knob 44 as shown in Fig. 6.

In Fig. 8 I have shown a modified embodiment of my piano in which one common electrical pick-up arrangement, e. g. one single pick-up coil 45 is provided for transforming the mechanical vibrations of reed 15 into electrical vibrations irrespective of the position of the key 10 and reed 15 supported by the same. This means that the pick-up arrangement 45 has to be constructed so as to be adapted to pick up the vibrations of reed 15 when the same is in its so-called second position shown in Fig. 5. I wish to stress that it is of advantage if this pick-up arrangement is also adapted to pick up the vibrations of reed 15 while it is moving between these two positions.

The pick-up arrangement 45 is connected with amplifier 29 and loud speaker 30 in the same manner as the pick-up arrangement 28 shown in Figs. 1 to 5 and described above in detail.

In the modified embodiment of my piano shown

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in Fig. 8, I do not provide any switch resistor 33 operated by the pedal 31. In this event pedal 31 operates only and exclusively switch 37 serving for retracting stop member 22 in the same manner as described above in connection with my piano shown in Figs. 1 to 5.

In a modified piano of this type there is no separate pedal pick-up coil but the sustaining effect is obtained only by pressing down the pedal 31 in direction of arrow 35 and thereby retracting the stop member 22 which otherwise would block vibration of reed 15 after release of key 10.

I wish to stress that although I mentioned above use of a "pick-up coil" or "pick-up coils" as electrical vibration pick-up arrangements, my present invention is in no way limited to the provision of such coil or coils. Such coils were mentioned only as examples for pick-up arrangements and my new piano may be provided with "electrical vibration pick-up arrangements" of whatever type if the same are adapted to pick up vibrations of the reeds and to transform them into electrical vibrations as necessary for the purposes of my present invention.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of electrical musical instruments differing from the types described above.

While I have illustrated and described the invention as embodied in electrical pianos, I do not intend to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of my invention.

Without further analysis, the foregoing will so fully reveal the gist of my invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What I claim as new and desire to secure by Letters Patent is:

1. In an electrical piano a series of vibration creating units, each of said vibration creating units comprising a vibratable steel reed; a turnable double armed lever having two lever arms, one of said lever arms serving as holding arm and supporting said vibratable steel reed secured thereto and permitting free vibration of said vibratable steel reed relative to said holding arm and the other of said lever arms serving as operating arm and being turnable so as to turn said holding arm together with said vibratable steel reed secured thereto; and blocking means arranged in the path of turning of said turnable double armed lever for stopping turning of the same.

2. In an electrical piano a series of vibration creating units, each of said units comprising a piano key; pivoting means turnably supporting said piano key so that the same consists of an outer operating key portion and an inner supporting key portion and both said key portions are turnable about said pivoting means; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; and a stop member arranged in the path of turning of said piano key.

3. In an electrical piano equipped with an el tric vibration pick-up arrangement, a series vibration creating units each of said vibra creating units comprising a vibratable steel r a movable holding member to which said is secured vibratably relative to said hold member; an operating member for moving holding member between inoperative position which said vibratable steel reed secured to holding member is outside of the pick-up sph of said electrical vibration pick-up arrangem and operative position in which said vibrata steel reed is within said pick-up sphere of electrical vibration pick-up arrangement; a stop member for engaging said holding mem and stopping movement of the same when in said operative position holding said vibrat steel reed within said pick-up sphere of electrical vibration pick-up arrangement.

4. In an electrical piano equipped with an el tric vibration pick-up arrangement, and a se of vibration creating units, each of said vib tion creating units comprising a vibratable reed; a turnable double armed lever having lever arms, one of said lever arms serving holding arm and supporting said vibratable s reed secured thereto so as to permit free vib tion of said vibratable steel reed relative to holding arm and the other of said lever a serving as operating arm and being turnable as to turn said holding arm together with vibratable steel reed between inoperative po tion in which said vibratable steel reed sec to said holding arm is outside of the pick- sphere of said electrical vibration pick-up rangement and operative position in which vibratable steel reed is within said pick-up sp of said electrical vibration pick-up arrangem and a stop member arranged in the path turning of said turnable double armed lever as to abruptly stop turning of said turna double armed lever and cause thereby vibrat of said vibratable steel reed secured to said ho ing arm of said turnable double armed lever wh said holding arm is turned by said operating a into said operative position.

5. In an electrical piano equipped with an el tric vibration pick-up arrangement, and a se of vibration creating units, each of said vib tion creating units comprising a piano key co sisting of an outer operating key portion and inner supporting key portion; a vibratable ma netized steel reed secured to said inner suppo ing key portion at the inner end thereof so to permit vibration of said vibratable magneti steel reed relative to said inner supporting portion; pivoting means supporting said pi key turnably between inoperative position which said vibratable steel reed secured to inner supporting piano key portion is outs of the pick-up sphere of said electric vibra pick-up arrangement and operative position which said vibratable steel reed is within pick-up sphere of said electric vibration pick- arrangement; and a slightly resilient stop me ber arranged in the path of turning of said pi key for abruptly stopping turning of the and cause thereby vibration of said vibrat steel reed secured to said inner supporting portion of said piano key when said piano is turned by said outer operating piano key tion forming part thereof from said inoperat into said operative position.

6. In an electrical piano a first electric vib tion pick-up arrangement, a second elect

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vibration pick-up arrangement located spaced from said first electric vibration pick-up arrangement, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key so that the same is turnable by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member arranged in the path of turning of said piano key for engaging said piano key and abruptly stopping turning of the same causing thereby vibration of said vibratable steel reed secured to said inner supporting key portion of said piano key when said piano key is turned by said outer operating key portion forming part thereof from said second position into said first position; and a second stop member arranged movably between stopping position located in the path of turning of said vibratable steel reed and non-stopping position located outside of said path of turning of said vibratable steel reed.

7. In an electrical piano a first electric vibration pick-up arrangement, a second electric vibration pick-up arrangement located spaced from said first electric vibration pick-up arrangement, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means supporting said piano key turnably by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member located in the path of turning of said piano key for engaging the same when it is in said first position with said vibratable steel reed located relatively near to said first electrical vibration pick-up arrangement; a second stop member arranged turnably between stopping position located in the path of turning of said vibratable steel reed between said first and said second position and non-stopping position located outside of said path of turning of said vibratable steel reed; electro-magnetic moving means for moving said second stop member from its said stopping position into its said non-stopping position; operating means for operating said electro-magnetic moving means; and a third stop member located in the path of turning of said piano key for engaging the same when it is in said second position with said vibratable steel reed located near said second electrical vibration pick-up arrangement.

8. In an electrical piano a first electric vibration pick-up arrangement, a second electric vibration pick-up arrangement located spaced from said first electric vibration pick-up arrangement, electrical sound reproducing means electrically connected at least with said second electrical vibration pick-up arrangement, switch means arranged in the connection between said second electrical vibration pick-up arrangement and said electrical sound reproducing means, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key so that the same is turnable by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member arranged in the path of turning of said piano key engaging the same when it is in said first position located relatively near to said first electrical vibration pick-up arrangement; a second stop member arranged movably between stopping position located in the path of turning of said vibratable steel reed between said first and said second position and non-stopping position located outside of said path of turning of said vibratable steel reed; a third stop member arranged in the path of turning of said piano key for engaging the same when it is in said second position located relatively near to said second electrical vibration pick-up arrangement; and operating means for turning said second stop member from its said stopping position into its said non-stopping position and for simultaneously closing said switch means thus establishing sound reproducing connection between said second electrical vibration pick-up arrangement and said electrical sound reproducing means.

9. In an electrical piano a first electric vibration pick-up arrangement, a second electric vibration pick-up arrangement located spaced from said first electric vibration pick-up arrangement, electrical sound reproducing means electrically connected at least with said second electrical vibration pick-up arrangement, switch means arranged in the connection between said second electrical vibration pick-up arrangement and said electrical sound reproducing means, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key so that the same is turnable by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member located in the path of turn-

ing of said piano key for engaging the same when it is in said first position with said vibratable steel reed located relatively near to said first electrical vibration pick-up arrangement; a second stop member arranged turnably between stopping position located in the path of turning of said vibratable steel reed between said first and said second position and non-stopping position located outside of said path of turning of said vibratable steel reed; electro-magnetic moving means for moving said second stop member from its said stopping position into its said non-stopping position; operating means for operating said electro-magnetic means so as to move said second stop member from its said stopping position into its said non-stopping position and to simultaneously close said switch means thus establishing sound reproducing connection between said second electrical vibration pick-up arrangement and said electrical sound reproducing means; and a third stop member arranged in the path of turning of said piano key for engaging the same when it is in said second position with said vibratable steel reed located near said second electrical vibration pick-up arrangement.

10. In an electrical piano a first electric vibration pick-up arrangement, a second electric vibration pick-up arrangement located spaced from said first electric vibration pick-up arrangement, electrical sound reproducing means electrically connected with both said electrical vibration pick-up arrangements, first switch means located in this connection between said electrical vibration pick-up arrangement and said electrical sound reproducing means, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key turnably by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member arranged in the path of turning of said piano key for engaging the same when it is in said first position with said vibratable steel reed located relatively near to said first electrical vibration pick-up arrangement; a second stop member arranged turnably between stopping position located in the path of turning of said vibratable steel reed between said first and said second position and non-stopping position located outside of said path of turning of said vibratable steel reed; electro-magnetic moving means for moving said second stop member from its said stopping position into its said non-stopping position; second switch means combined with said electro-magnetic moving means for operating the same; operating means for simultaneously closing both said switch means whenever desired; and a third stop member arranged in the path of turning of said piano key for engaging the same when it is in said second position with said vibratable steel reed located near said second electrical vibration pick-up arrangement.

11. In an electrical piano a first electric vibration pick-up arrangement, a second electric vibration pick-up arrangement arranged spaced from said first electric vibration pick-up arrangement, electrical sound reproducing means electrically connected with both said electric vibration pick-up arrangements, first switch means arranged in this connection between said electrical vibration pick-up arrangement and said electrical sound reproducing means, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key turnably by turning said outer operating key portion between a first position in which said vibratable steel reed secured to said inner supporting key portion is located relatively near to said first electrical vibration pick-up arrangement and a second position in which said vibratable steel reed is located relatively near to said second electrical vibration pick-up arrangement; a first stop member arranged in the path of turning of said piano key for engaging the same when it is in said first position with said vibratable steel reed located relatively near to said first electrical vibration pick-up arrangement; a second stop member arranged turnably between stopping position located in the path of turning of said vibratable steel reed between said first and said second position and non-stopping position located outside of said path of turning of said vibratable steel reed; electro-magnetic moving means for moving said second stop member from its said stopping position into its said non-stopping position; second switch means combined with said electro-magnetic moving means for operating the same; operating means for simultaneously closing both said switch means whenever desired; spring means for automatically turning said second stop member from its said stopping position when not held by said electro-magnetic moving means in said non-stopping position; and a third stop member arranged in the path of turning of said piano key for engaging the same when it is in said second position with said vibratable steel reed located near said second electric-vibration pick-up arrangement.

12. In combination a piano key; pivoting means for turnably supporting said piano key; a magnetized member secured to one end of said piano key; and a freely vibratable steel reed secured to the same end of said piano key in contact with said magnetized member.

13. In combination equipped with an electrical vibration pick-up arrangement, a piano key; a magnetized freely vibratable steel reed secured to one end of said piano key; pivoting means turnably supporting said piano key with said freely vibratable steel reed secured to said piano key movably in the pick-up sphere of said electrical vibration pick-up arrangement; and stop means located in the path of turning of said piano key for engaging the same when said freely vibratable steel reed secured to said piano key is located near said electric vibration pick-up arrangement in the pick-up sphere of the same.

14. In combination a piano key; a permanent magnet secured to one end of said piano key and a freely vibratable reed secured to the same

end of said piano key in contact with said permanent magnet.

15. In an electrical piano equipped with an electric vibration pick-up arrangement, and a series of vibration creating units each comprising a piano key consisting of an outer operating key portion and an inner supporting key portion; a vibratable magnetized steel reed secured to said inner supporting key portion at the inner end thereof permitting vibration of said vibratable magnetized steel reed relative to said inner supporting key portion; pivoting means turnably supporting said piano key turnably by turning said outer operating key portion between a first and a second position being spaced from each other and in both of which positions said vibratable steel reed secured to said holding arm of said piano key is located within the pick-up sphere of said electrical vibration pick-up arrangement; a first stop member located in the path of turning of said piano key for engaging said piano key and abruptly stopping turning of the same causing thereby vibration of said vibratable steel reed secured to said inner supporting key portion of said piano key when said piano key is turned by said outer operating key portion forming part thereof from said second position into said first position; and a second stop member arranged movably between stopping position located in the path of turning of said vibratable steel reed and non-stopping position located outside of said path of turning of said vibratable steel reed.

16. In an electrical piano in combination an elongated stationary inductance coil; sound reproducing means for transforming electrical current created in said elongated inductance coil into audible sound waves; a series of different inductor members located side by side along said elongated inductance coil; a series of supports for said different inductor members each holding one of said different inductor members vibratably in a plane being normal to the longitudinal axis of said elongated stationary inductance coil; and a series of piano key members each serving for vibrating one of said different inductor members in said plane normal to the direction of said longitudinal axis of said elongated stationary inductance coil.

17. In an electrical piano in combination an elongated stationary inductance coil; sound reproducing means for transforming electrical current created in said elongated inductance coil into audible sound waves; a series of elongated magnetized inductor members located in a plane parallel to each other with their tips reaching near said elongated stationary inductance coil; a series of supports for said magnetized inductor members each holding one of said different inductor members vibratably in a plane being normal to the longitudinal axis of said elongated stationary inductance coil; and a series of piano key members each serving for vibrating one of said different inductor members in said plane normal to the direction of said longitudinal axis of said elongated stationary inductance coil.

18. In an electrical piano a series of vibration creating units, each of said vibration creating units comprising a support; a holding member freely movably secured to said support; a stop member arranged in the path of movement of said freely movable holding member for abruptly stopping movement of the same during movement of said holding member; an operating member for moving said freely movable holding member against said stop member; and a vibratable reed secured to said holding member so as to vibrate relative to said holding member when said holding member is moved by said operating means against said stop member and abruptly stopped by the same.

19. In an electrical piano a series of vibration creating units, each of said vibration creating units comprising a support; a holding member freely turnably secured to said support; a stop member arranged in the path of turning of said freely turnable holding member for abruptly stopping turning of the same during turning of said holding member; an operating member for turning said freely turnable holding member against said stop member; and a vibratable reed secured to said holding member so as to vibrate relative to said holding member when said holding member is turned by said operating means against said stop member and abruptly stopped by the same.

20. In an electrical piano a series of vibration creating units, each of said vibration creating units comprising a support; a holding member freely turnably secured to said support; a stop member arranged in the path of turning of said freely turnable holding member for abruptly stoping turning of the same during turning of said holding member; an operating member for turning said freely turnable holding member against said stop member; and a vibratable magnitized steel reed secured to said holding member so as to be adapted to vibrate relatively to said holding member when said holding member is turned by said operating means against said stop member and abruptly stopped by the same.

21. In an electrical piano a series of vibration creating units, each of said vibration creating units comprising a support, a holding member freely turnably secured to said support, a stop member arranged in the path of turning of said freely turnable holding member for abruptly stopping turning of the same during turning of said holding member, an operating member for turning said freely turnable holding member against said stop member, and a vibratable magnetized steel reed secured to said holding member so as to be adapted to vibrate relatively to said holding member when said holding member is turned by said operating means against said stop member and abruptly stopped by the same; an elongated stationary inductance coil arranged extending along said series of vibration creating units within the zone of inductance of said vibratable magnetized steel reeds; and sound reproducing means for transforming electrical current created in said elongated inductance coil into audible sound waves.

OCTAVIO JOSE ALVAREZ.

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May 16, 1950 J. SJÖLANDER 2,508,300

MUSICAL INSTRUMENT

Filed April 5, 1948

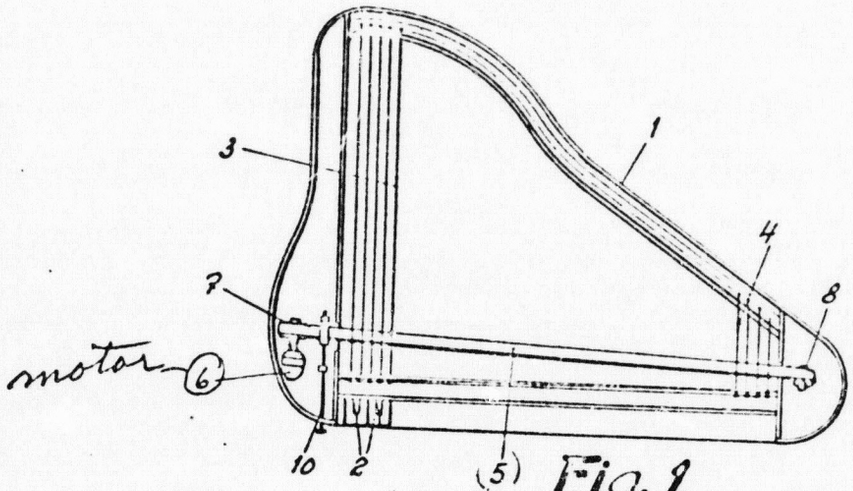


Fig. 1.

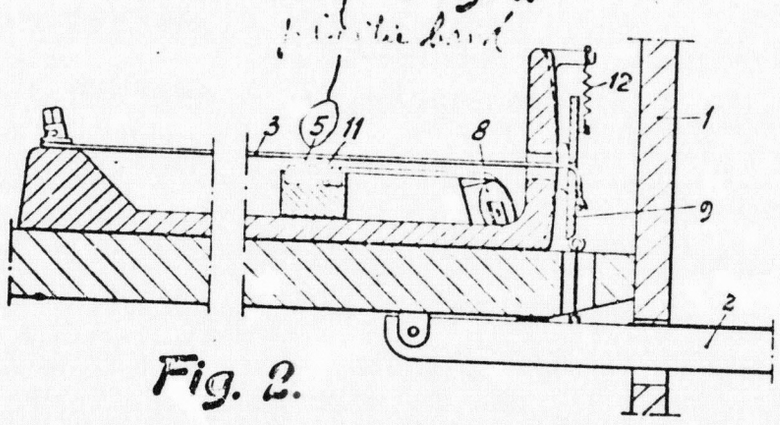
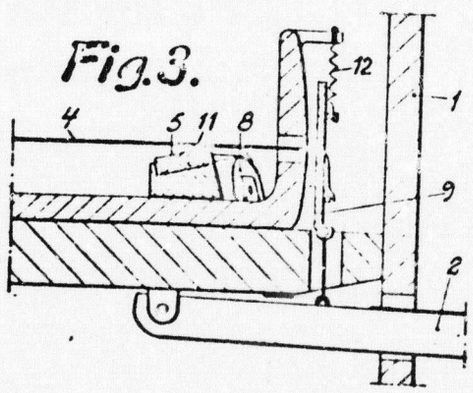


Fig. 2.

Fig. 3.



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Patented May 16, 1950 2,508,300

UNITED STATES PATENT OFFICE

2,508,300

MUSICAL INSTRUMENT

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In Sweden April 11, 1917

3 Claims. (Cl. 84—257)

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The present invention relates to improvements in stringed instruments, particularly pianos, grand pianos and the like, and is substantially characterized by an endless band driven by an electric motor and arranged, in the proximity of the strings of the instrument and approximately at right angles to their longitudinal direction, against which band every string is adapted to be brought, during the running of the band, by means of manually operable keys. The endless band is preferably mounted in a twisted condition, for instance along a felt bedding, in a manner such that the band is enabled for a certain length thereof to actuate some of the strings all over its width, and for another length to actuate other strings only by an edge portion of the band, all of the strings of the instrument being operable, however, by one and the same band. The endless band may consist of plastic material, and one end of each string may be operable by the depression of an ordinary key and by means of a spring, which is retracted to an initial position, when the key is no longer depressed. The speed of the driving motor for the endless band is controllable by means of a brake member or a pedal or the like actuating the control of the motor current.

The accompanying drawing illustrates a form of embodiment of the invention.

Fig. 1 is a top plan view of a grand piano, the lid of which is removed, and which has incorporated therein an embodiment of the invention. Fig. 2 is a vertical section to a larger scale of a detail of the grand piano with a string and a key, and Fig. 3 represents a vertical section of a grand piano with the key thereof in depressed position.

In the various figures, 1 designates a grand piano, 2 the key, 3 and 4 strings in the bass octaves and the treble respectively, and 5 denotes an endless plastic band disposed at right angles to the longitudinal direction of the strings and adapted to be driven by an electric motor 6, said band running over two guide wheels 7 and 8, the axes of which are not parallel but disposed obliquely relatively to each other in such manner that the band is twisted to a certain extent, so that in the example of embodiment shown the band 5 runs parallel to and somewhat underneath the strings in the bass octaves (Fig. 1) over its entire width, when the strings are not actuated, whereas in the treble (Fig. 2) the band approaches the strings with an edge portion of the same. The band 5 preferably rests on a stationary felt bedding 11. Each key 2 is coupled to a

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slide 9, which is adapted to be displaced upwardly into an initial position by means of a drawspring 12 and to be depressed by the key, said slide having the one end of a string 3 (4) secured thereto. Through the depression of the key 2 a string is brought into contact with the endless band 5, which in operation serves as a bow on the string, a peculiar tone being thus produced. Said tone can be said to be an intermediate between a violin tone and an ordinary piano tone. The speed of the band 5 is controllable by means of a braking member 10. By means of arrangements (not shown) a resinous substance or the like may be applied to the band 5. In place of the braking member 10, a pedal contrivance may be made use of, and if desired the motor current may of course be varied by means of an adjustable resistance. The arrangement according to the invention may be disconnectible, so that a piano or the like can be used in the ordinary manner.

Obviously, the details above described may also be constructed in other ways, without departing from the principle of the invention.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

1. In an instrument equipped with strings; a power driven endless bow-band arranged in the proximity of said strings and at right angles to the longitudinal direction of the latter, means for reciprocably moving each of said strings to and from said band, a pair of rollers arranged below said strings and rotatable about axes extending obliquely with respect to each other, whereby said endless band is guided over said rollers in twisted position, and stationary pad means for supporting said band between said rollers, a predetermined length of said twisted band being adapted to actuate some of said strings, another length of said twisted band being arranged to present an edge portion thereof for coaction with other of said strings.

2. In an instrument according to claim 1, wherein said means for reciprocably moving each of said strings include a respective key and a slide member connected therewith, and means resiliently supporting one end of each string by the respective slide member.

3. In an instrument equipped with strings; a power driven endless bow-band arranged in the proximity of said strings and at right angles to the longitudinal direction of the latter, means for reciprocably moving each of said strings to

and from said band, means for guiding said endless band below said strings partly in parallel and partly in overedge position to said strings, whereby some of said strings may be brought in contact with the parallel portion of said endless band, whereas other strings are adapted for contact with the edge portion of said band.

JOSEF SJÖLANDER.

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June 6, 1950 E. O. FLEURY 2,510,094

MUSICAL INSTRUMENT

Filed May 25, 1946 2 Sheets-Sheet 1

Fig. 1.

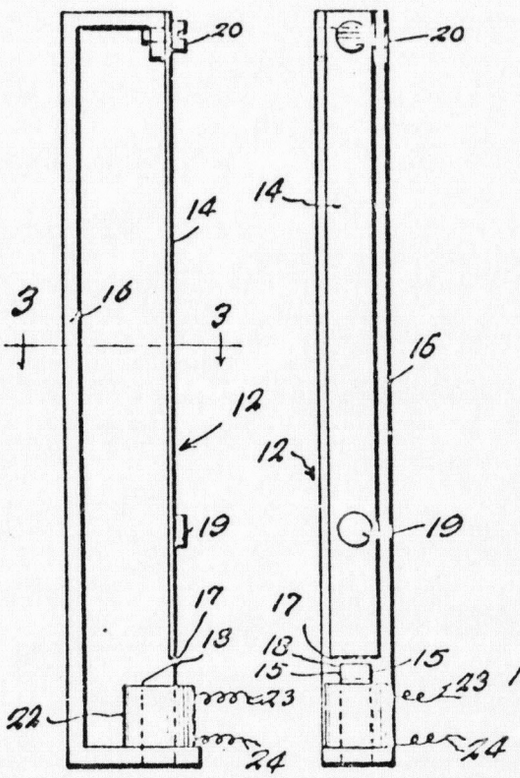


Fig. 2.

Fig. 3

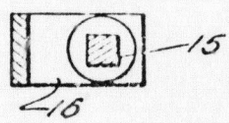


Fig. 6.

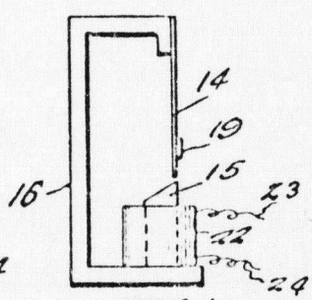


Fig. 7

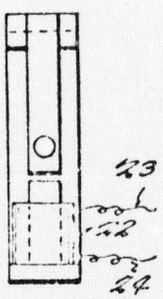


Fig. 8

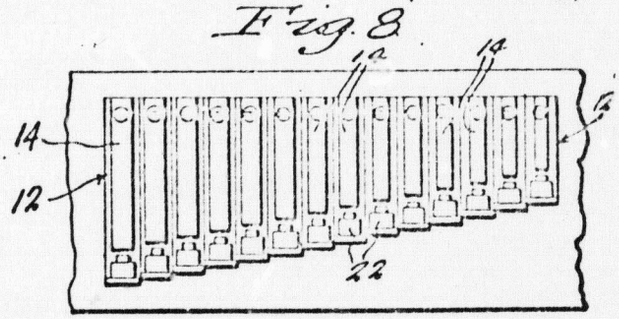
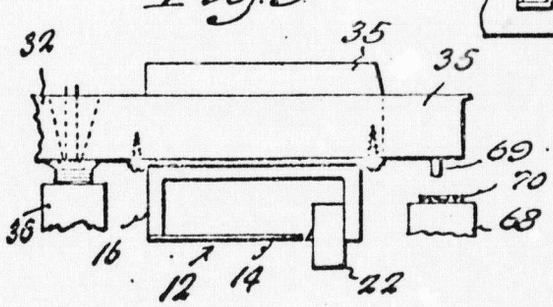


Fig. 9



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Attorneys

June 6, 1950 E. O. FLEURY 2,510,094

MUSICAL INSTRUMENT

Filed May 25, 1946 2 Sheets-Sheet 2

Fig. 4.

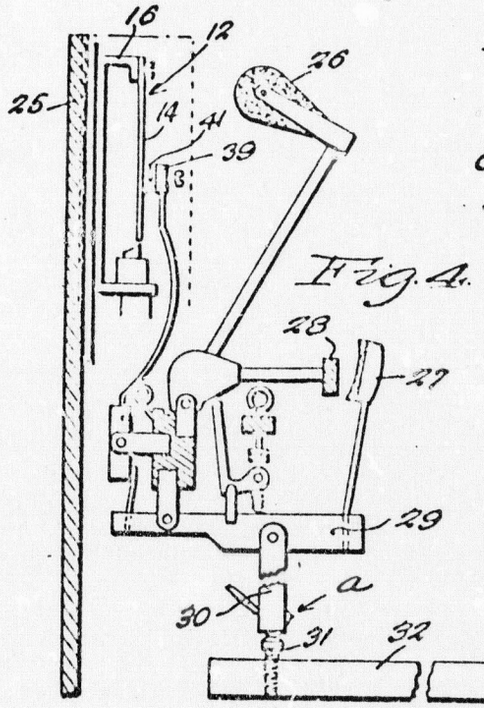

Fig. 5.

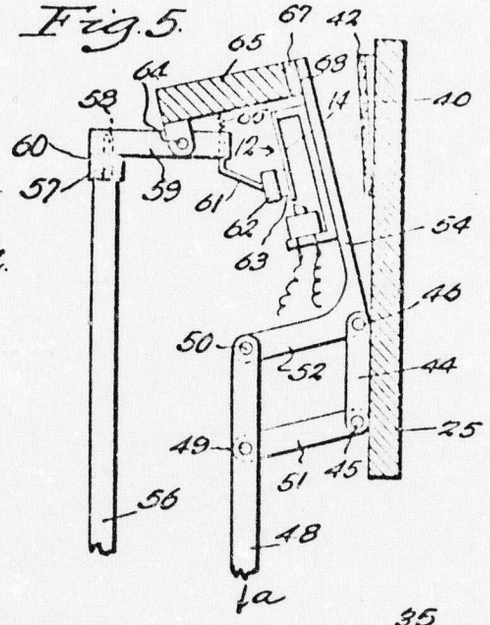

Fig. 10.

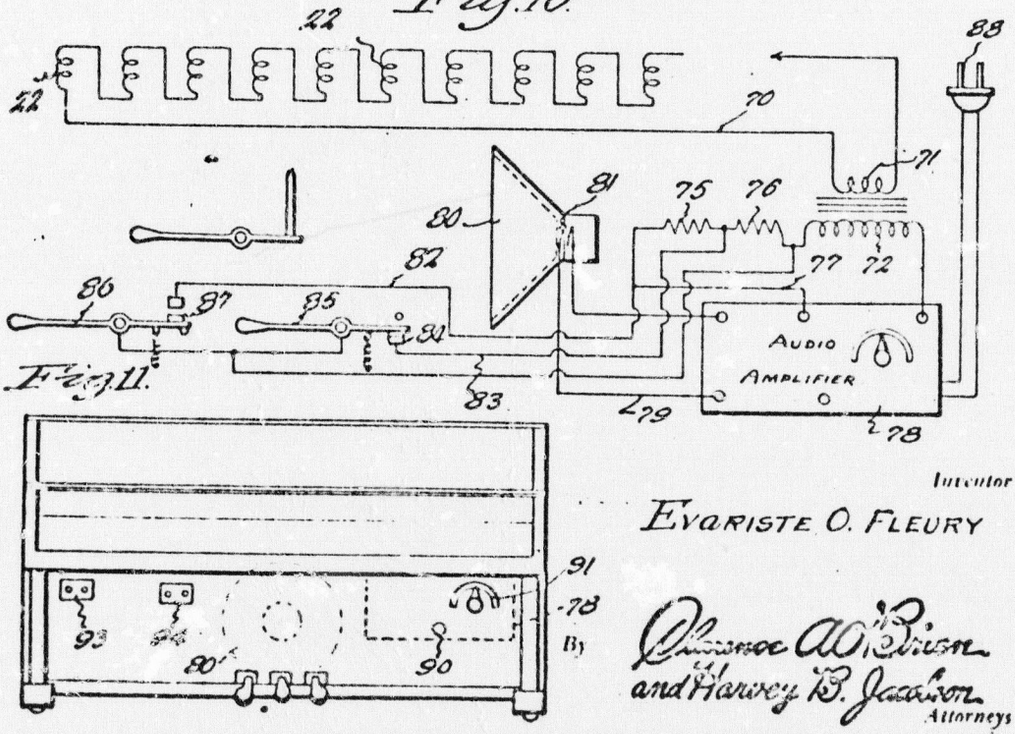

Fig. 11.

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Patented June 6, 1950 2,510,094

UNITED STATES PATENT OFFICE

2,510,094

MUSICAL INSTRUMENT

Evariste O. Fleury, Lewiston, Maine

Application May 25, 1946, Serial No. 672,223

6 Claims. (Cl. 84—1.15)

1

This invention relates to musical instruments, and more particularly to musical instruments operated by keys. The principal object of the invention consists in providing a musical tone or note producing unit which, when operated, generates electrical oscillations of the exact frequency corresponding to the musical tone or note associated with the key. These electrical oscillations may then be used to operate an electro-acoustic sound production system.

A further object of the invention consists in providing a unit of the type mentioned which produces the electrical oscillations by means of a reed or flat spring having a natural frequency with which it will oscillate, if receiving impulses either directly or by using its inertia. The natural frequency of a reed is defined very exactly and therefore permits to obtain clear tones.

A still further object of the invention consists in making the reed operative by placing it into a magnetic circuit in alignment with a core carrying a coil, the said two members serving to close said magnetic circuit completely with the exception of a small gap left between them. Preferably the cross sections of the reed and the core facing each other on both sides of said gap are approximately the same so that the vibration of the reed will cause a regular or sinusoidal variation of the magnetic flux, and of the current induced thereby in the coil carried by said core.

A further object of the invention consists in providing a musical instrument, using the aforesaid units for producing electrical oscillations of a frequency corresponding to a definite musical tone or note, in which the keys allotted to each musical tone or note are operating a mechanism provided with a striking member or a mechanism adapted to impart a rapid movement to one of the units, which movement is automatically and suddenly arrested. In the first case the vibration is caused directly by the impact of said striking member on the vibrating reed, while in the second case the inertia of the reed causes vibration with natural frequency. The movement of the striking member or of the movable member supporting the above described unit may either be produced by means of a so-called action or it may be produced by attaching the note producing units directly to the keys.

A still further object of the invention consists in providing a volume control of the sound produced which may be either mechanical and may consist in means for regulating the damping of the oscillations of the reed or may be electrical, the latter method being preferable in cases in

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which mechanical control entails constructive difficulties or in which the sound volume control is intended to be carried beyond the limits within which mechanical means will operate.

Further objects will be apparent from the following detailed specification describing several embodiments of the invention. It is to be understood that these embodiments are examples for illustrative purposes and are not intended to be limitative. The invention is described in such terms that the expert skilled in this art will readily understand that certain details and constructional features are subject to change without in any way departing from the invention.

In the accompanying drawings:

Figures 1 and 2 are elevational side and front views, respectively, of a single tone producing unit according to the inveniton.

Figure 3 is a cross sectional plan view of said unit, the cross section being taken along the line 3—3 of Figure 1.

Figure 4 is an elevational side view of one embodiment of the invention using the so-called action now used for striking the piano strings and for damping the oscillation for operating the tone producing units according to the invention.

Figure 5 is an elevational side view of a modification of the action specially adapted for the purpose in question.

Figures 6 and 7 are elevational side views similar to those of Figures 1 and 2 showing units used for the highest tones.

Figure 8 is an elevational side view of the back board of a piano with the tone producing units shown in Figures 4, mounted thereon.

Figure 9 is an elevational side view of another tone producing arrangement in which no action at all is used, the tone producing unit being directly attached to the keys of the piano.

Figure 10 is a diagram showing the general arrangement and the electric connections of the modification illustrated in Figure 9 or in Figure 5.

Figure 11 is an elevational view of a complete piano, illustrating the arrangement of the main components.

In order to explain the object of the invention in general terms, it may be mentioned that it is the main purpose of the invention to produce electrical oscillations corresponding exactly to the musical tone which is allotted to each key of the piano or other musical instrument. While the keyboard and the operational method of producing music by depressing keys corresponding to

certain notes remains essentially unchanged, the oscillations directly produced by the keys are not sound vibrations but are electrical oscillations which may be reproduced in the usual manner by a loud speaker, by a telephone or the like or may be recorded in the well known manner. This electrical reproduction method permits a far better regulation of the volume of sound delivered and it may even be used—in the event that music is practiced—in such a way that merely the operator, or a selected number of persons, is enabled to hear the music produced; a result which is easily obtained by using earphones. Conversely, a piano of the type described may be used with a volume of sound which exceeds by far that which can be produced by the conventional type of piano, so that music for a large open air audience, dance music for open air, or for a plurality of rooms, etc., may be produced individually without the intermediation of a public address system which, as a rule, is imperfect from a musical point of view.

The main element of the invention consists in the tone producing unit 12, allotted to each key of the piano or other musical instrument, which replaces the piano string conventionally used. This unit consists of a flat spring or reed 14 of a predetermined length attached to a frame 16 of magnetically permeable material, which is closed on three sides and open at the fourth side. This open side is partly closed by the reed 14 and partly by a core 15 of magnetically permeable material projecting from the frame towards the spring. Only a small gap 17 is left between these two parts. The core may be bevelled so that it tapers toward the edge 18 facing the reed 14. The magnetic lines of force are thus concentrated in a zone corresponding to the cross section of the spring.

The reed may, if necessary, be loaded by a weight 19. It is fixed at one end on the frame 16 by means of a screw 20. A reed or flat spring attached at one end has, as well known a very exactly defined natural frequency or resonance frequency, determined by its own free length, if not loaded, or by the distance of the center of gravity of the oscillating system from the point of attachment, if loaded. The reed or spring of each unit is, therefore, so selected that its natural frequency corresponds to that of the musical tone or note to be produced by one key.

The core 15 is surrounded by a coil 22 provided with fine windings, the wire leading to and from said coil being indicated at 23, 24.

The frame is preferably laminated and consists of a large number of lamellae. Said frame is magnetized so as to form a magnet.

It will be clear that if the reed 14 or the frame is struck by some device or if it is moved and its movement is suddenly arrested it will leave its central position of rest and will oscillate with its natural frequency. The magnetic reluctance of the system which was closed over the small gap 17 when the reed was at rest will vary in accordance with this oscillation and currents corresponding to said oscillations will be set up in the coil 22.

To start oscillations of the reed, the conventional mechanism, called action, may be used as illustrated in Figure 4. The units 12 may be aligned along the back board 25 of the piano or other instrument as no resonance board or the like is necessary (see Figures 4 and 8). These units as is seen differ as regards the free length of the reed and the length of the frame 16 varies

correspondingly. However, the cores 15 and coils 22 are preferably the same for all spring lengths.

The conventional action such as shown in Figure 4 need not be described in detail as the mechanism is identical with the standard mechanism now used. It comprises the hammer 26, the check 27, cooperating with the back stop 28, the wippen 29, the prolong 30, cooperating with the capstan screw 31 directly operated by the key lever 32 which forms a continuation or projection of the key 35 which turns around the balance rail 36.

The damping mechanism again is practically identical with the damping mechanism as conventionally used and comprises the damper block 39, the head 41 of which is applied against spring 14 of the unit 12, much in the same way in which it is usually applied against the piano string.

The conventional action now in use which was developed for piano strings, although suitable to operate units according to the present invention may, however, be simplified to a marked degree.

This simplification is shown in Figure 5 in which the back board 25 does not carry the units but is provided with the check 40 which in this case consists of a wedge-shaped member lined with felt 42. It also carries a rail 44 which supports two pivot pins 45, 46. The prolong 48 which cooperates with the capstan screw 31 and key lever 32 in the way shown in the lower part of Figure 4 marked by reference letter *a*, is provided with two further pivot pins 49, 50, and is linked to the rail 44 by means of links 51, 52, turning around the pivot pins 49, 50 and 45, 46. Thus a lever parallelogram is formed which will keep the prolong 48 in its vertical position while moved by the key. The link 52 may form part of or may be connected with a bracket 54 extending upwardly from the lever parallelogram and carrying the note or tone producer unit 12.

The damping mechanism in this case is operated by the pedal rod 56, which is connected with one of the pedals of the piano. At its upper end the pedal rod 56 carries an action rail 57 which is provided with pins 58 holding action levers 59. A felt washer 60 may be interposed between said rail and sail levers and centered around the pins 58.

Each action lever 59 carries a damper wire 61 at the end of which the damper block 62 is attached. The block 62 carries the damper head 63 made of suitable material such as a piece of fur of piled fabric and the like which is to be applied against the reed 14 of the unit 12.

The action lever 59 is pivoted at 64 on a stationary supporting rail 65 and is held in its position of rest by a spring 66. The supporting rail may project towards the bracket 54, and may be provided with an end surface 67 which is parallel to the bracket 54 when at rest and is heavily lined with felt 68 in order to form a back stop for the moving parts of the mechanism.

It will be clear from the above that the downward movement of key 35 causes an upward movement of capstan screw 31 and of prolong 48 which will move the bracket 54 against the back wall 35. This movement is suddenly stopped by the felt 42 on member 40; the reed 14 of the unit 12, therefore, starts its oscillations which will last until the bracket 54 falls back. When the bracket returns the starting of a new series of oscillations is effectively prevented by the back stop felt 67.

The oscillations of the reed are [illegible] damped by damper head 62, held aga

by spring 66. If the oscillations should continue, the sustaining pedal is operated whereby the rail 57 is moved and lifts the damper head from the reed 14.

A further simplification of the arrangement results if the note or tone producing units 12 are directly fixed on the keys 35 as shown in Figure 9. Preferably the units are fixed on the keys between the keybed frame 68 and the balance rail. Each key is, as usual, provided with a stop pin 69 striking against a felt pad 70 on the keybed frame 68. To increase the force necessary to move the keys and to make it equal to the force necessary to move a key against the resistance of the action now in use, the key levers 32 may be loaded by means of weights (now shown).

The means for translating the electrical oscillations into sound oscillations are shown in Figures 10 and 11. This Figure also shows an electric volume control of the tones which may be applied instead of the mechanical volume controls produced by damping in those cases in which the introduction of a mechanical control entails constructional complications.

In Figure 10, the coils 22 are all arranged in series although other connections would be possible likewise. These coils form part of a circuit 70 which may or may not be provided with an amplification stage and which is closed by the step up transformer 71. The secondary 72 of the transformer is connected in series with two resistances 75 and 76 which are provided for volume control purposes. The entire circuit 77 containing the said elements forms the input circuit of an audio amplifier 78 having as many amplification stages as the purpose of the instrument may require. The output circuit 79 of said amplifier is connected with the voice coil 81 of the loud speaker 80.

The two resistances 75 and 76 have parallel circuits 82, 83 by means of which they may be short circuited. One of these circuits 83 may be permanently closed by means of the contacts 84 of the pedal 85. The second circuit 82 is open at the contacts 87 as long as the loud pedal is not operated.

A sustaining pedal may be used in addition if, for instance, an arrangement similar to that shown in Figure 5 is employed. In this case the sustaining pedal may operate the pedal rod 58.

It will be clear that the oscillations produced by the depression of a key of the instrument will induce currents in coils 22, the voltage of which is stepped up in the transformer while currents are magnified by the amplifier or amplifiers used. These currents act on the loud speaker 80. They have to pass resistance 75 while resistance 76 is normally short circuited. If the forte or loud pedal 86 is operated it closes a short circuit around resistance 75 and no resistance is then included in the input circuit of the audio amplifier 78. The notes produced will, therefore, have maximum volume. If soft pedal 85 is pressed the short circuit to resistance 75 is interrupted and this resistance is now active in series with resistance 75. The volume will, therefore, be cut down to a minimum.

The amplifier or amplifiers may be supplied with current from any suitable source of electrical energy, a plug connection 88 being shown for this purpose.

The piano equipped with the tone or note producer units may have approximately the shape of a conventional piano. Figure 11 shows the outline.

The speaker may be arranged in the center of the back wall or in the center of the front wall above or below the key frame, the latter case being shown in the Figure. The audio amplifier 78 is best arranged on one side with its front wall carrying the switch 89 and the main adjustment control 91 projecting outwardly. The adjustment control has only to be operated occasionally and readjustment is only necessary at long intervals, or with a change of the use to which the instrument is put. The switch 89 has to be operated before use of the piano. The plug in contacts 93, 94 may be used for earphones or for the connection of the piano with a distant speaker.

It will be clear that the quality of the music instrument may be improved in many ways, if desired. For instance, if it is desired to produce not only the basic musical note but also certain harmonics a plurality of juxtaposed units or of juxtaposed reeds and coils may be substituted for the single unit.

Moreover, it will be clear that the mechanical and electrical details of mechanisms have been specifically described merely in order to be able to illustrate the principles by means of specific examples, but, as it is the principle which constitutes the invention, these specific details may be replaced by others without in any way affecting the invention.

I claim:

1. A device for use in musical instruments for producing musical tones by means of electrical oscillations, comprising a key, a unit for translating mechanical oscillations of a frequency corresponding to the frequency of the musical tone to be produced into electrical oscillations, said unit including a frame of magnetized ferro-magnetic material open along one side, a magnet core with a reduced substantially linear end face, a flat strip-like transversely oscillating reed with one freely oscillating and one fixedly supported end of a predetermined free length corresponding to a predetermined natural frequency of transverse oscillations, having a substantially linear end face at its free end, said magnet core and said transversely oscillating reed being longitudinally aligned and being mounted on opposite sides of said frame, projecting towards each other along the open side of the said frame and substantially closing the open side of the frame, with their substantially linear end faces facing each other across a narrow gap, a coil mounted on said magnet core with its longitudinal axis extending along the axis of said core for producing currents induced by the variation of the magnetic flux through said core, means operated by the key for moving said unit, a fixed member for arresting said movement and for causing an impact producing a vibration of the reed with its natural frequency and an electro-acoustic translation means for translating the electrical oscillations into sound oscillations.

2. A device for use in musical instruments for producing musical tones by means of electrical oscillations, comprising a key, a unit for translating mechanical oscillations of a frequency corresponding to the frequency of the musical tone to be produced into electrical oscillations, said unit including a frame of magnetized ferro-magnetic material, open along one side, a magnet core with a reduced substantially linear end face, a flat strip-like transversely oscillating reed with one freely oscillating and one fixedly supported end of a predetermined free length corresponding

to a predetermined natural frequency of transverse oscillations, having a substantially linear end face at its free end, said magnet core and said transversely oscillating reed being longitudinally aligned and being mounted on opposite sides of said frame, projecting towards each other along the open side of the said frame and substantially closing the open side of the frame, with their substantially linear end faces facing each other across a narrow gap, a coil mounted on said magnet core with its longitudinal axis extending along the axis of said core for producing currents induced by the variation of the magnetic flux through said core, means operated by said key to impart a rapid motion to said unit, means to arrest said motion to cause the reed to oscillate with its natural frequency, and an electro-acoustic translation means for translating the electrical oscillations into sound oscillations.

3. A device for use in electrical musical instruments, producing electrical oscillations corresponding to a musical tone comprising a magnetized frame of ferro-magnetic material open along one side, a magnet core with a reduced substantially linear end face, a flat, strip-like, transversely oscillating reed with a freely oscillating and a fixedly supported end of a predetermined free length corresponding to a predetermined natural frequency of its transverse oscillations, said reed having a substantially linear end face at its free end, said magnet core and said transversely oscillating reed being longitudinally aligned and being mounted and projecting from opposite sides of the frame toward each other along the open side of the said frame, so as to substantially close said open side, with the substantially linear end faces of the core and the free end of the reed facing each other across a narrow gap, a coil on said magnet core with its longitudinal axis extending along said core for producing electrical oscillations and mechanical means for producing a vibration of the reed with its natural frequency.

4. A device for use in musical instruments producing musical tones by means of electrical oscillations comprising a unit for translating mechanical oscillations of a frequency corresponding to the frequency of the musical tone to be produced into electrical oscillations, said unit including a frame of magnetized ferro-magnetic material, open along one side, a magnet core with a reduced substantially linear end face, a flat, strip-like transversely oscillating reed with a freely oscillating end and a fixedly supported end of a predetermined free length, corresponding to a predetermined natural frequency of its transverse oscillations, having a substantially linear end face at its free end, said magnet core and said transversely oscillating reed being longitudinally aligned and being mounted on opposite sides of said frame, and projecting towards each other along the open side of the said frame, said core and said reed substantially closing the open side of the frame with their substantially linear end faces facing each other across a narrow gap, a coil mounted on said magnet core with its longitudinal axis extending along the said core for producing currents induced by said core, a key, carrying said unit, said unit being fixedly attached to said key, with the reed in substantial parallelism to said key, means for arresting the movement of said key, to produce an oscillation of the reed by inertia upon arrest of the key and an electro-acoustic translation means for translating the electrical oscillations into sound oscillations.

5. A device for use in musical instruments for producing musical tones by means of electrical oscillations comprising a key, a unit for translating mechanical oscillations of a frequency corresponding to the frequency of the musical tone to be produced into electrical oscillations, said unit including a frame of magnetized ferro-magnetic material open along one side, a magnet core with a reduced substantially linear end face, a flat strip-like transversely oscillating reed with a freely oscillating end and a fixedly supported end of a predetermined free length, corresponding to a predetermined natural frequency of its transverse oscillations, having a substantially linear end face at its free end, said magnet core and said transversely oscillating reed being longitudinally aligned and being mounted on opposite sides of said frame, projecting towards each other along the open side of said frame and substantially closing said open side, with the substantially linear end face of the core and the free end of the reed facing each other across a narrow gap, a coil mounted on said magnet core with its longitudinal axis extending along said core for producing induced currents, a rigid backboard, a support for said unit pivoted to said rigid backboard, a mechanical link connection between said pivoted support and said key, adapted to produce a motion of said pivoted support towards said fixed backboard cushioning means on the latter arresting the movement of the pivoted support, a further rigid support, forming a rest for the support of the unit, damping means applied against the reed in the position of rest, said means being pivotally mounted on said further rigid support, a pedal and means for connecting said pivoted damping means with said pedal.

6. A musical instrument provided with a number of devices according to claim 1 wherein the electro-acoustic translation device includes two resistances arranged in series, shunt circuits across each of said resistances, and two pedals, each provided with a contact for controlling one of said shunt circuits.

EVARISTE O. FLEURY.

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Feb. 13, 1951 H. ZIMMERMAN 2,541,143

TOY MUSICAL INSTRUMENT

Filed Sept. 11, 1948

Fig. 1.

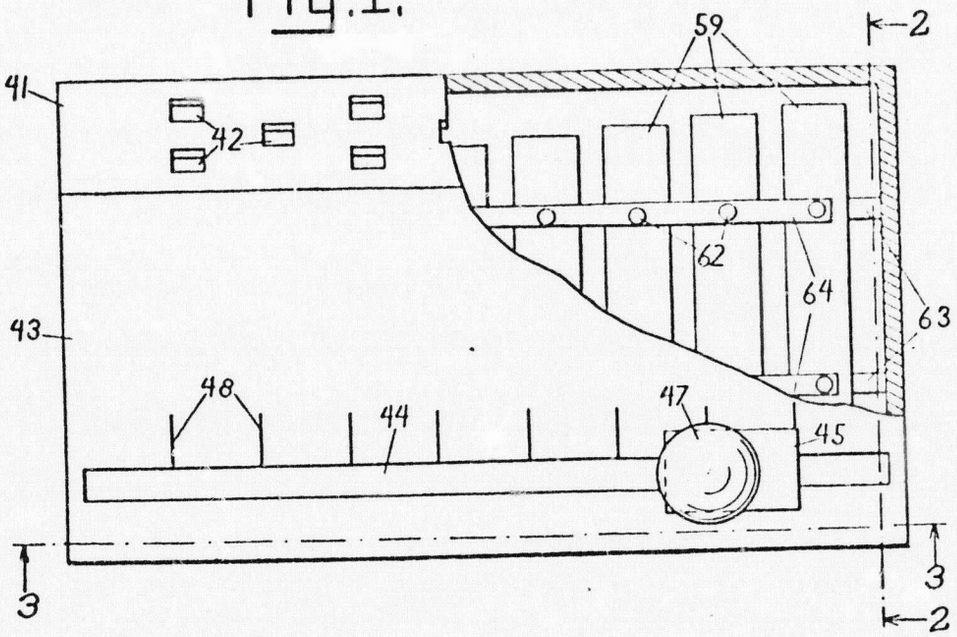


Fig. 2.

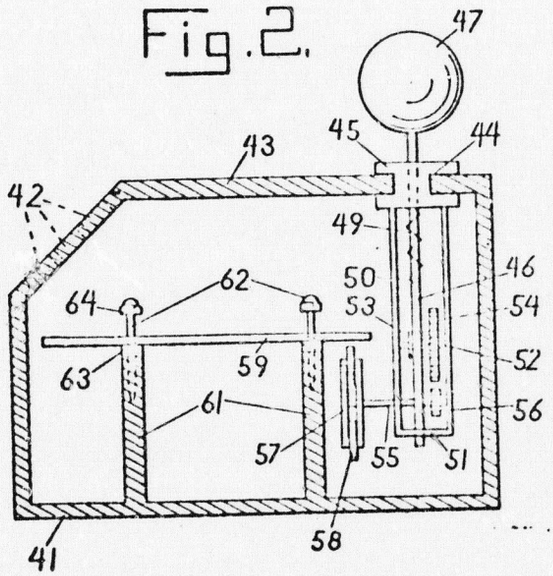
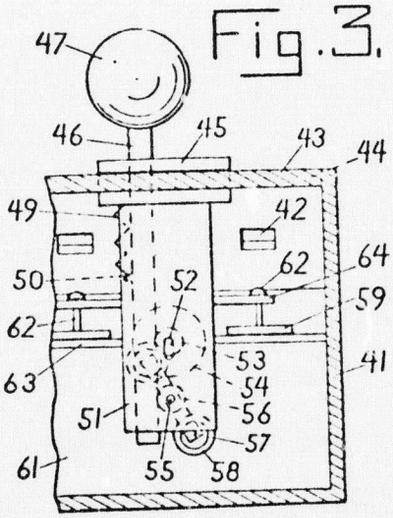


Fig. 3.



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Attorney

Patented Feb. 13, 1951

2,541,143

UNITED STATES PATENT OFFICE

2,541,143

TOY MUSICAL INSTRUMENT

Harry Zimmerman, New York, N. Y.

Application September 11, 1948, Serial No. 48,831

9 Claims. (Cl. 84—104)

1

My invention relates to musical toys of that type which produces a melody or a series of different tones by strokes hitting differently tuned bars or sounding elements.

Objects of my invention are to produce tremolant tones or tones comprising a plurality of individual sound impulses following each other quickly, to produce each plurailty of impulses or each tremolant tone by one stroke of the player's hand or finger, to create loud, clear and ringing sounds overlapping in one tone, and thereby to provide a novel toy having a particularly pleasant musical effect.

Other objects are to produce this effect with a toy that can be easily played by a child, and to provide the toy with a mechanism which produces the tremolant nature of the tones automatically whenever the player strikes a tone.

Further objects are to achieve these results with simple and inexpensive means, and to provide a novel musical toy that can be manufactured easily and quickly.

Still other objects and advantages will appear from the following description of an exemplifying embodiment of my invention, from the appended claims and from the accompanying drawing in which:

Fig. 1 shows a top view of an illustrative embodiment, a portion of the cover being broken off.

Fig. 2 shows a cross-section taken along the line 2—2 in Fig. 1.

Fig. 3 shows a cross-section of a broken off part of the latter embodiment, said cross-section being taken along the line 3—3 in Fig. 1.

The embodiment shown in Figs. 1 to 3 comprises one striking device shiftable relative to several tone bars whereby the same striking member may hit any one of a row of differently tuned tone bars. This arrangement makes the embodiment similar to a xylophone.

A casing 41 may have openings 42 for the escape of sound waves and has a cover 43 provided with a slot 44. A block 45 of I-shaped cross-section is slidable along the slot 44 and has an opening through which a rod 46 passes. The upper end of the rod 46 is affixed to a handle or knob 47. By horizontal movement of the handle 47, the block 45 can be shifted from one to another of a plurality of positions which are indicated by suitable indicia, for example, by lines 48 extending perpendicularly to the slot 44 on the top surface of the cover 43.

The rod 46 passes vertically slidably through the block 45. By vertical movement of the handle

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47, the rod 46 can be moved down against the pressure of a spring 49 which has a lower end affixed to a projection 50 of the rod 46 and has an upper end affixed to the block 45.

The rod 46 forms a part of a mechanism which transforms the vertical movement of the handle into a rotary movement comprising several turns during one stroke of the handle. The rod 46 has a lower end passing slidably through an opening in the bottom of a U-shaped frame 51 which is affixed to the lower side of the block 45. A shaft 52 carrying a pinion 53 and a toothed wheel 54 is rotatably journalled in the elongated vertically extending slots formed in opposite side portions of the frame 51. A shaft 55 carrying a pinion 56 is disposed below and parallel to the shaft 52 and has the opposite ends thereof journalled in the side portions of the frame 51. A part of the rod 46 which is positioned within the frame 51 is provided with teeth whereby the rod constitutes a rack meshing with the pinion 53. Initial downward movement of the rod 46 effects similar downward movement of the shaft 52 until the latter reaches the bottom of the slots. In this position of the shaft 52, the toothed wheel 54 meshes with the pinion 56 on the shaft 55. Further downward movement of the rod 46 causes rotation of the pinion 53, the wheel 54, and the pinion 56 for rotating the shaft 55.

An arm 57 has a center affixed to the shaft 55 and has ends carrying loosely connected striking members 58. For example, the members 58 may be washer-like rings, and the arm 57 may form an elongated loop passing through the rings 58 with clearance. When the members 58 rotate with the arm 57 and the shaft 55, the centrifugal force moves the members radially to their most outward positions.

The plane in which the members 58 rotate is vertical and preferably parallel to the slot 44. Tone bars 59 are arranged in a row which extends in the direction of the slot 44 and are substantially horizontally positioned at a level so far above the shaft 55 that each tone bar reaches in the upper part of the members' rotary paths when the shaft 55 is positioned vertically under the respective tone bar 59. The shaft 55 can be moved into position under any of the tone bars by shifting the handle 47 and thereby the block 45 together with the entire striking mechanism in the manner described before.

In the mentioned position of rest, the tone bars 59 are supported by walls 61 crossing the interior of the casing 41 in directions parallel to the slot 44. The tone bars are free to move up-

wardly under the impact of the members 58 and are guided in this upward movement by headed nails 62 driven into the top surfaces of the walls 61 and passing through openings in the bars. The tone bars drop to the supported position immediately after the passage of a striking member. The top surfaces of the walls 61 may be covered with cushioning layers 63. Other cushioning layers 64 may extend under the heads of the nails 62. The nails pass through the layers 63 and 64.

The handle 47 serves two purposes. By horizontal movement of the handle, the striking mechanism is brought into proper position relatively to any desired tone bar. By vertical movement downwardly, this tone bar is struck. When the rod 46 is depressed and subsequently released, the spring 49 will urge the rod 46 towards the original elevated position thereof. Upward movement of the rod 46, meshing with the pinion 53 on the shaft 52, will effect upward movement of the latter within the elongated slots and thereby disengage the wheel 54 from the pinion 56 to permit free-wheeling of the shaft 55. Therefore, the rod 46 will only drive the shaft 55 during the downward movement of the former. Hence any desired sequence of tones can be produced by simple movements of one hand.

I desire it understood that my invention is not confined to the particular embodiments shown and described, the same being merely illustrative, and that my invention may be carried out in other ways without departing from the spirit of my invention as it is obvious that the particular embodiments shown and described are only a few of the many that may be employed to attain the objects of my invention.

Having described the nature of my invention, what I claim and desire to protect by Letters Patent is:

1. In a musical toy, a horizontally disposed rotatable shaft, a striking member on said shaft, striking elements carried by the opposite ends of said member and defining a circular closed path when said shaft is rotated, a vertically movable tone bar extending into said circular closed path when in lowermost position for contact with said striking elements and movable upwardly out of said path, and means rotating said shaft in one direction so as to effect striking of said elements against said tone bar from below.

2. In a musical toy, a rotatably mounted striking member having striking elements on the opposite ends describing a closed circular path when said member is rotated, and operating means for rotating said member including a pinion fixedly connected to said member, a rotatable gear means mounted for axial movement relative to the axis of rotation of said pinion, linearly movable means meshing with said gear means and adapted, when moved in one direction, to mesh said gear means with said pinion and to effect the rotation of said gear means, spring means constantly urging said linearly movable means in the direction opposed to said one direction for disengaging said gear means from said pinion, and a tone bar supported in a position where said bar reaches into said closed circular path.

3. In a musical toy, a rotatably mounted striking member having striking elements on the opposite ends describing a closed circular path when said member is rotated, a tone bar supported in a position where said bar reaches into said closed circular path, and operating means for rotating said striking member including a linearly movable member and gear means interposed between said linearly movable member and said striking member, said gear means constantly engaging said linearly movable member and engaging said striking member only when said linearly movable member is moved in a selected direction.

4. In a musical toy, a substantially horizontally disposed tone bar mounted for limited vertical movement, a striking member rotatable about a horizontal axis and having striking elements on the opposite ends thereof describing a closed circular path when said member is rotated, said tone bar in the lowermost position thereof extending into said circular path adjacent the top portion of said path and movable vertically out of said path, and operating means for rotating said striking member in a direction so that said striking elements strike against said tone bar from below, said operating means including a linearly movable member and gear means meshing with said linearly movable member and engaging said striking member only when said linearly movable member is moved in one direction to thereby effect rotation of said striking member in said above mentioned direction.

5. In a musical toy, the combination according to claim 3, wherein said gear means includes a pinion fixed relative to said striking member, a rotatable toothed wheel fixed to a shaft extending parallel to the axis of rotation of said pinion and movable radially thereof in a plane parallel to the line of movement of said linearly movable member, a second pinion fixed to said toothed wheel, a gear rack formed on said linearly movable member meshing with said second pinion, and spring means connected to said linearly movable member constantly urging the latter in a direction away from the axis of rotation of said first pinion, said toothed wheel meshing with said first pinion when said linearly movable member is moved against the force exerted by said spring means thereby rotating said striking member and being disengaged from said first pinion when said linearly movable member is moved in said direction urged by said spring means to thereby permit free wheeling of said striking member.

6. In a musical toy having a housing, a frame extending into said housing and slidably carried by the latter for movement therealong, a horizontally disposed shaft rotatably mounted in said frame, a striking member on said shaft, striking elements carried by the opposite ends of said member and defining a circular closed path when said shaft is rotated, a plurality of vertically movable tone bars in said housing disposed at right angles to the direction of movement of said frame, each of said tone bars extending into said circular closed path when in lowermost position and in registry with said frame and movable upwardly out of said path, and means carried by said frame rotating said shaft in one direction so as to effect striking of said elements against a selected one of said tone bars from below.

7. In a musical toy, a supporting structure, a frame slidable along said structure, a rotatably arranged striking element, operating means carried by said frame for carrying and rotating said element in a closed circular path, a plurality of tone-elements, disposed across the sliding direction of said frame, being supported in positions where each tone-element, when in registry with said frame, reaches into said path whereby the tone-element is struck by said striking element.

and being movable in the direction of said strokes out of said path.

8. In a musical toy, a supporting structure, a frame slidable along said structure, a rotatably arranged striking element, operating means carried by said frame for carrying and rotating said element during each single operation in a closed circular path, a plurality of tone-elements disposed across the sliding direction of said frame, being supported in positions where each tone-element, when in registry with said frame, reaches into said path whereby the tone-element is struck by said striking element, and being movable in the direction of said strokes out of said path.

9. In a musical toy, a supporting structure, a frame slidable along said structure, a member rotatably connected to said frame and having an eccentric end, a striking element loosely connected to said end, operating means carried by said frame for rotating said member with said element in a closed circular path, a plurality of tone-elements, disposed across the sliding direction of said frame, being supported in position where each tone-element, when in registry with said frame, reaches into the path of said striking element whereby the tone-element is struck by said striking element, and being movable in the direction of said strokes out of said path.

HARRY ZIMMERMAN.

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SEARCH ROOM

June 9, 1953 J. D. ENOCHS ET AL 2,641,153

HAMMER ACTION FOR MUSICAL INSTRUMENTS

Filed Oct. 26, 1948 2 Sheets-Sheet 1

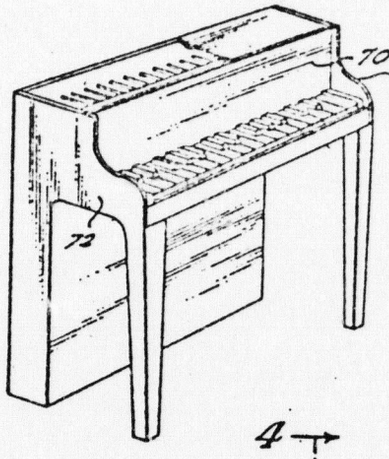

Fig. 1

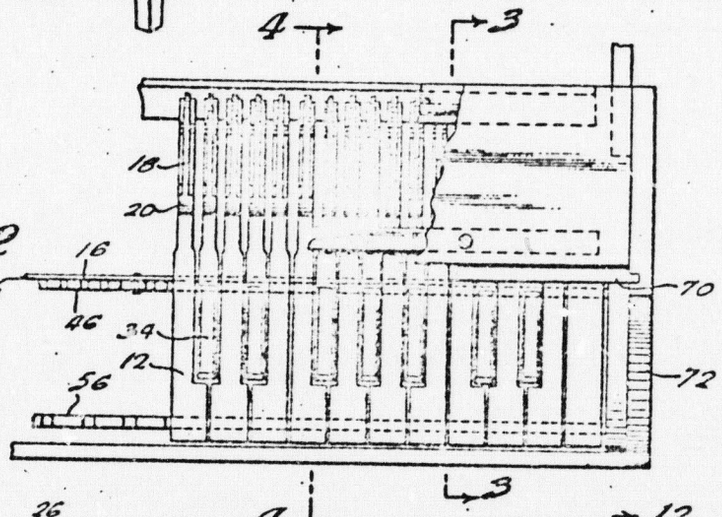

Fig. 2

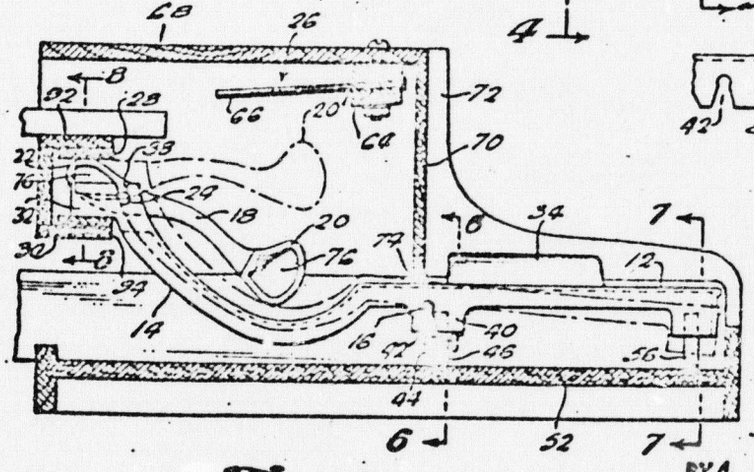

Fig. 3

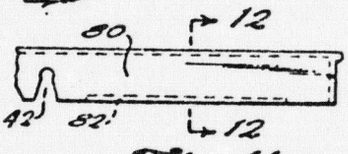

Fig. 11

Fig. 12

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June 9, 1953 J. D. ENOCHS ET AL 2,641,153

HAMMER ACTION FOR MUSICAL INSTRUMENTS

Filed Oct. 26, 1948 2 Sheets-Sheet 2

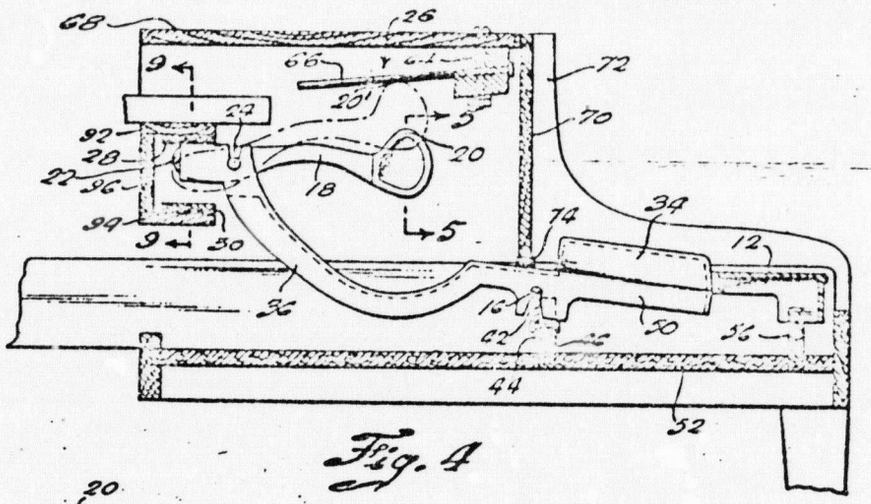

Fig. 4

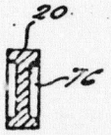

Fig. 5

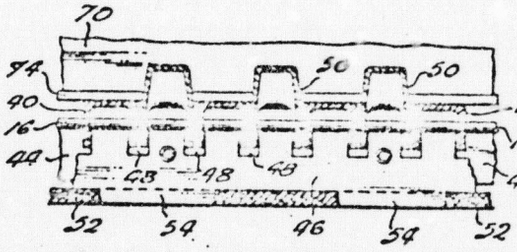

Fig. 6

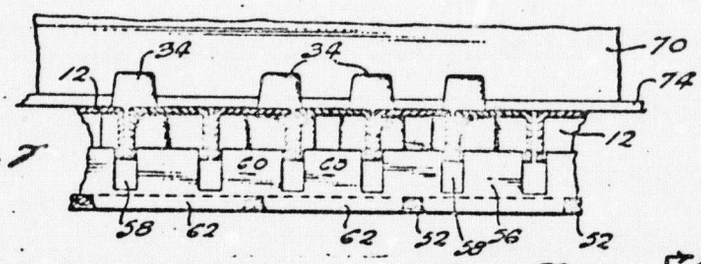

Fig. 7

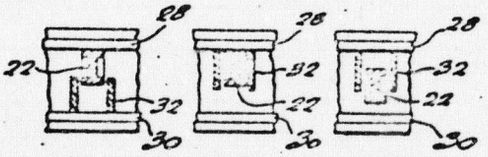

Fig. 8

Fig. 9

Fig. 10

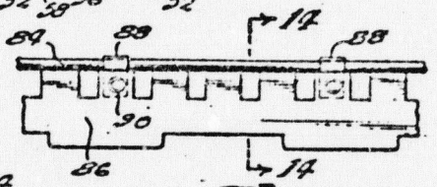

Fig. 13

Fig. 14

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UNITED STATES PATENT OFFICE

2,641,153

HAMMER ACTION FOR MUSICAL INSTRUMENTS

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Application October 26, 1948, Serial No. 56,532

16 Claims. (Cl. 84—403)

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This invention relates to musical instruments, and more particularly to a toy piano.

The primary object of the present invention is to generally improve toy pianos. A more particular object is to provide a simplified key and hammer action. Another object is to design the parts for ease of assembly, thereby decreasing labor cost in manufacture of the instrument. More specific objects are to improve the pivoting of the hammer on the key, and the pivoting of the key in the instrument. Further objects are to improve the means for guiding and locating the keys, and for limiting the motion thereof.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, our invention resides in the toy piano elements and their relation one to another as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings in which:

Fig. 1 is a perspective view showing a toy piano embodying features of the present invention;

Fig. 2 is a fragmentary plan view with a part of the case broken away;

Fig. 3 is a section taken approximately in the plane of the line 3—3 of Fig. 2;

Fig. 4 is a section taken approximately in the plane of the line 4—4 of Fig. 2, with a black key depressed;

Fig. 5 is a section through the hammer taken approximately in the plane of the line 5—5 of Fig. 4;

Fig. 6 is a fragmentary section taken approximately in the plane of the line 6—6 of Fig. 3;

Fig. 7 is a section taken approximately in the plane of the line 7—7 of Fig. 3;

Figs. 8, 9 and 10 are schematic sections taken approximately in the plane of the line 8—8 of Fig. 3 and are explanatory of the key action.

Fig. 11 is a side elevation of a modified key;

Fig. 12 is a section taken approximately in the plane of the line 12—12 of Fig. 11;

Fig. 13 is a fragmentary elevational view of a modified fulcrum; and

Fig. 14 is a section through the same taken in the plane of the line 14—14.

Referring to the drawing, and more particularly to Fig. 1, the musical instrument is here illustrated as a toy piano of the spinet type. It will be understood that the key and hammer action may be applied to other musical instruments having sound-producing means different from that here shown, or located in cases of different configuration. However, the compactness of the hammer action, making it suitable for a spinet case, is one of its advantages. It should also be understood that the individual keys need not be miniature in dimension, and in fact in the particular toy here shown the white and black keys are each of standard size, although the keyboard has only two and a half octaves.

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Referring now to Fig. 3, the key 12 has a rearward extension 14, and is pivoted at 16 intermediate the key and extension. The free end of the extension 14 carries a hammer 18, the head end 20 of which extends towards the forward end of the key, and the tail end 22 of which extends beyond the pivot 24 of the hammer. The sound producing means 26 is disposed over the hammer, and a stop bar 28 is disposed above the tail 22 of the hammer. It will be evident that when the key is depressed the pivot 24 is raised, thus raising the hammer head 20 to strike the sound producing means 26.

Considering the arrangement in greater detail, another stop bar 30 is preferably disposed below the rear end 32 of key extension 14. The proportioning and disposition of the parts is such that when the key 12 is in raised position, the part 32 rests on bar 30, and the tail 22 rests (bearing upwardly) on bar 28. The latter contact limits the downward movement of the head 20, but is not essential because other motion limiting means might be employed, in which case the tail 22 might be spaced downwardly from the bar 28 when the key is in rest position. The advantage of the present arrangement is that cushioning material, specifically, strips of felt at 28 and 30, act as silencing means for the different movements. The head 20 does not hit or rest on the extension 14. This relationship or rest position is shown in solid lines in Fig. 3. When the key is depressed, as indicated in broken lines in Fig. 3, the pivot 24 is raised, thus raising the hammer 20, and the parts momentarily take a new position, shown in broken lines. This relation of the parts is also shown in Fig. 9 of the drawing. However, the hammer head 20 continues its upward movement under inertia and so strikes the sound producing means 26, as is best shown by the broken line position in Fig. 4. The relation of the tail parts at this time is also shown in Fig. 10. After striking the sound producing means and setting the same into vibration, the hammer immediately falls back out of the way to its rest position, this being shown in solid lines in Figs. 4 and 9, and in broken lines in Fig. 3.

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Thus the proportioning of the parts is preferably such that when the key is depressed the extension 32 bears against the upper stop bar 28, and the tail 22 bears against the top bar 23, at which time, however, the head 20 has not risen sufficiently to reach the sound producing means. When the head continues rising by inertia until it strikes the sound producing means, the tail 22 moves downwardly toward but does not reach the bottom stop bar 30. For this reason, and also because of the immediate drop of the hammer, there is no damping of the vibration at 26.

The keys and hammers are preferably molded out of a suitable plastic. For ease in molding it is preferably a thermoplastic material, although a thermosetting material could be employed. The key 12 and extension 14 are preferably molded out of a single piece of white plastic. Referring to Fig. 4, the black key 34 and its extension 36 are preferably molded out of a single piece of black plastic. However, we have also made keys in which the key portion is molded separately from the extension, the two being subsequently overlapped and cemented together. In that case the extensions may all be of one color. The hammer with its head and tail is also preferably molded in one piece, and in this case the color is, of course, immaterial.

The key extension as molded is preferably bifurcated at its rear end, thus providing the spaced walls 32 best shown in Fig. 8. These walls are provided with bearings to receive trunnions 24, which are preferably molded integrally with the hammer. The walls 32 are preferably notched from one edge to the bearings, as is indicated by the notch 38 in Fig. 3. The notches converge toward the bearings to a size smaller than the diameter of the trunnions and bearings, but not much smaller, so that the trunnions may be pressed into the bearings with a snap fit. Thus the parts are readily assembled together and remain in assembled relation.

The keys also are preferably pivoted in the piano with a detachable or snap fit. Thus in Fig. 3 it will be seen that the side walls 40 of the key are provided with bearings and with notches 42 leading upwardly from the bottom of the walls to the bearings, said notches converging toward the bearing holes to a dimension somewhat smaller than the diameter of the holes. The pivot or fulcrum may be a rod, but in the present case is a round bead 16 at the upper edge of a flat strip 44. To mount the keys on the strip 44 they are simply pressed downwardly over the beaded edge 16. This does not limit the keys against sideward movement, but that is taken care of by additional means next described.

In Figs. 2 through 6 it will be seen that the strip 44 is riveted or eyeletted to a strip 46 which is preferably made of a suitable fibre board or thick, heavyweight cardboard or paperboard. The latter is secured edgewise beneath the keyboard, and in effect the assembly of two strips comprises an edgewise strip with a fulcrum rod at the top. The upper edge of the strip 48 is recessed to form projections which fit between the side walls of the keys, thus locating the keys against sideward movement. This is best shown in Fig. 6, in which it will be seen that strip 46 is notched or castellated along its upper edge, thus forming recesses 48 which receive the side walls 40 of the white keys and the side walls 50 of the immediately adjacent black keys. Of course, there is adequate clearance for free action of the keys, and as is shown, the side walls of the keys are made smooth and straight, such that the keys may bear against one another without appreciable friction. However, the locating notches avoid the possibility of all of the keys throughout the keyboard being moved wholly in one direction or the other, with excess cumulative clearance space at one end or the other of the keyboard.

The paperboard strip 46 may be secured in position in a number of ways. As here illustrated it is strongly secured by mounting it with a mortise and tenon connection on a thick paperboard or fibre board bottom wall 52 forming a part of the instrument case and located beneath the keyboard. As is best shown in Fig. 6, the strip 46 is recessed to provide tongues or tenons 54, and the bottom wall 52 is slotted or mortised to tightly receive the tenons 54. The parts are glued together, thus forming a sturdy, rigid structure.

The white keys are guided by additional guide means located near their forward ends. This is done by means of a guide strip shown at 56 in Figs. 3, 4 and 7. The strip 56 is notched or castellated on top, thus forming recesses 58 which receive the adjacent side walls of the white keys. The tops of the projections 60 between the recesses 58 are preferably made of suitable height to limit downward movement of the keys when depressed. It was previously mentioned that the ends of the key extensions bear against top stop 28 when the key is depressed, and that limitation is preferred in order to provide maximum movement of the pivot 24 of the hammer. Nevertheless the stops 60 at the forward ends of the keys are useful in protecting the key against excessive downward pressure. Thus a slight clearance may be left between the keys and the stops 60 when the key is depressed gently, but on increased pressure the key yields slightly and then rests on the stops 60. The guide strip 56 thus acts also as a stop strip.

The guide strip 56 is secured in position much as was described for the fulcrum strip 46, it being shaped on bottom to provide tenons 62 which are received in mating slots or mortises in the bottom wall 52 of the instrument. Here again the strip and bottom wall are glued together.

The sound producing means is preferably stringless, and various known constructions may be employed, such as those using plates, tubes, forks, etc. In the present case the sound producing means consists of a metal bar 64 having a series of spring steel rods 66 mounted therein. The rods may be simple round rods and, of course, vary in length along the keyboard to produce the desired tones or vibration frequencies. To secure the rods in bar 64 the bar may be provided with a series of holes fitting the rods, and if desired the stationary ends of the rods may be flattened somewhat before driving the rods through the holes, thus insuring a force fit.

Other details of construction will probably be apparent from study of the drawing. However, it may be pointed out that bar 64 is preferably secured to the top wall 68 (Fig. 3) of the piano case, the latter preferably being made of wood. The front wall 70 (Fig. 1) is slid downwardly into position from above, with its ends received in grooves formed in the end walls 72. The lower edge of wall 70 is preferably provided with a heavy sponge rubber strip 74 (Fig. 3) which rests against the white keys just back of the raised portions of the

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tops of the keys without inhibiting movement thereof. Of course, the movement at this point is slight because the wall 70 is located substantially over the pivot bar of the keys.

The hammers 10 are broadened at the head 20, as is best shown in Fig. 2. The ends may be recessed as shown at 76 in Figs. 3 and 5 to lighten the same and to lessen the amount of plastic material needed.

The keys 12 and extensions 14 are preferably hollow. As here illustrated the keys comprise top and side walls, and the same applies to the extensions 14. At the rear end 32, however, there is neither a top wall nor a bottom wall, the side walls 32 being left to receive the tail 22 of the hammer. In Fig. 3 it will be seen that the side walls of the white keys are recessed upwardly somewhat, thus conserving material. From inspection of Fig. 2 it will be appreciated that the white keys are of four types which differ when viewed in plan, thus providing the necessary room to receive the black keys. This, of course, is conventional.

In one specific case the bearing hole for the key was 0.133" in diameter and the slot leading to the same had an entrant width of 0.1875" and a minimum width at the bearing hole of 0.118". In the case of the bearing for the hammer trunnion, the bearing hole had a diameter of 0.129", and the minimum width of the entrant slot was 0.121", the initial or entrant width being 0.156". The initial width is, of course, not at all critical, and even the difference in width at the bearing hole is not wholly critical, but the dimensions mentioned above provide a desired snap fit. It must be understood that these dimensions are given solely by way of illustration, and not in limitation of the invention.

A modified construction for the key is shown in Figs. 11 and 12. In this case the side walls 80 are maintained at full height, and most of the bottom of the key is closed by means of a bottom wall 82, this consisting of a rectangular piece of plastic which is secured in position, as by means of a cement or solvent. The bottom edges of the side walls 80 may be stepped to receive the edges of the bottom wall.

A modified form of fulcrum strip is shown in Figs. 13 and 14. In this case the fulcrum rod 84 is a cylindrical rod which is set directly above the heavy paperboard strip 86. The latter is provided with recesses or castellations on top, and with tenons on bottom, just as was previously described. However, to secure the rod 84 to the strip 86 thin bands of metal 88 are bent around the rod at intervals, the lower ends being received in a cut or split in the top of the strip 86, and being secured in position by appropriate eyelets 90. The rod 84 may be made of metal or of a plastic. In the case of the instrument here shown in Figs. 3, 4 and 6, in which the rod is a bead formed integrally with a web, the beaded strip is preferably made of a plastic.

The top and bottom stop bars 28 and 30 previously referred to are preferably made by forming a channel of strips of wood, there being a top strip 92 (Fig. 4), a bottom strip 94, and a connecting or spacer strip 96. Layers of felt 28 and 30 are cemented to the top and bottom strips 92 and 94. The felt is preferably of substantial thickness, say ⅛", and in that sense it may be said that the complete stop bars are composite bars consisting of felt or silencing material combined with rigid backing material.

[illegible] the construction, method of assembly, and advantages of our improved musical instrument will be apparent from the foregoing detailed description. It will also be apparent that while we have shown and described our invention in a preferred form, changes may be made without departing from the spirit of the invention, as sought to be defined in the following claims.

We claim:

1. A key and hammer action for a toy piano, said action comprising a key with a rearward extension, means pivoting the same intermediate the extension and key, the free end of the extension extending upward and being bifurcated and pivotally carrying between the bifurcations thereof a hammer the head end of which extends toward the key and above the extension, and the tail end of which extends beyond the pivot of the hammer between the bifurcations of the extension, sound producing means disposed over said hammer, a first felted stop bar disposed below the rear end of the extension, and a second felted stop bar disposed above the rear end of the extension and hammer in such a position as to act as a stop for both, said latter stop bar being fixed at such height as to prevent the bottom end of the hammer head from striking the extension even when the key is in its raised or rest position.

2. A key and hammer action for a musical instrument, said action comprising a key with a rearward extension, means pivoting the same intermediate the extension and key, the free end of the extension pivotally carrying a hammer the head end of which extends towards the key, and the tail end of which extends beyond the pivot of the hammer, sound producing means disposed over said hammer, and stop bars disposed below and above the rear end of the extension and hammer, whereby when the key is in raised or rest position the extension rests on the lower stop bar, and when the key is in depressed position the tail bears against the top stop bar, the proportioning and disposition of the parts being such that at the latter time the hammer head is not raised sufficiently to reach the sound producing means, and when the hammer head continues rising by inertia it strikes the sound producing means and the tail moves downwardly toward but does not reach the bottom stop bar.

3. A key and hammer action for a toy piano, said action comprising a key with a rearward extension, means pivoting the same intermediate the extension and key, the free end of the extension being bifurcated and pivotally carrying between the extension thereof a hammer the head end of which extends toward the key, and the tail end of which extends beyond the pivot of the hammer between the bifurcations of the extension, sound producing means disposed over said hammer, and felted stop bars disposed below and above the rear end of the extension and hammer, whereby when the key is in raised position the extension rests on the lower stop bar and the tail bears against the upper stop bar, and when the key is in depressed position the extension bears against the top stop bar and the tail bears against the top stop bar, the proportioning and disposition of the parts being such that at the latter time the hammer head is not raised sufficiently to reach the sound producing means, and when the hammer head continues rising by inertia it strikes the sound producing means and the tail moves downwardly toward but does not reach the bottom stop bar.

4. A key and hammer combination as defined in claim 2, in which the key and extension are molded integrally out of a plastic, and in which the entire hammer is molded integrally out of a plastic.

5. A key and hammer combination as defined in claim 2, in which the sound producing means is stringless and comprises a bar carrying a series of spring steel rods of varying length, the rods being disposed over the hammers.

6. A key and hammer combination as defined in claim 1, in which the key and extension are molded integrally out of a plastic, and are hollow, and in which the entire hammer is molded integrally out of a plastic, and is solid, and in which the sound producing means is stringless and comprises a bar carrying a series of spring steel rods of varying length, the rods being disposed over the hammers.

7. A musical instrument comprising a keyboard made up of collaterally disposed horizontal hollow keys each having vertical side walls, a stationary fulcrum strip mounted edgewise beneath said keyboard and extending transversely of the keys, the upper edge of said fulcrum strip being notched or castellated to form projections which fit between the side walls of the keys in order to locate the keys against sideward movement, said fulcrum strip having a continuous stationary fulcrum rod secured along its upper edge, and the side walls of said keys being notched upwardly from the bottom edges to form bearings to receive said fulcrum rod, whereby the keys may be placed downward from above into position on the fulcrum rod.

8. A musical instrument comprising a keyboard made up of collaterally disposed horizontal hollow keys each having vertical side walls, a stationary fulcrum strip mounted edgewise beneath said keyboard and extending transversely of the keys, the upper edge of said fulcrum strip being notched or castellated to form projections which fit between the side walls of the keys in order to locate the keys against sideward movement, said fulcrum strip having a continuous stationary fulcrum rod secured along its upper edge, the side walls of said keys being notched upwardly from the bottom edges to form bearings which fit over said fulcrum rod, whereby the keys may be placed downward from above into position on the fulcrum rod, and said strip having a thickness much greater than the diameter of said rod, and thereby bearing against the inside of the side walls of the keys despite said notches in said side walls.

9. A toy piano comprising a case, and a keyboard made up of collaterally disposed hollow keys each having top, front and side walls, said case having a bottom wall disposed beneath said entire keyboard, a key guide strip mounted edgewise on said bottom wall beneath the forward ends of the keys, the lower edge of said guide strip being recessed to form tenons, and said bottom wall being slotted to receive said tenons, the upper edge of said guide strip being castellated to form projections which fit between the side walls of the keys in order to locate the keys against sideward movement, and the tops of the projections of said strip being of suitable height to limit the maximum downward movement of the keys when fully depressed.

10. A musical instrument comprising a keyboard made up of collaterally disposed hollow keys each having top and side walls, a stationary fulcrum strip and a stationary key guide strip each mounted edgewise beneath said keyboard in collateral spaced relation, the key guide strip being located near the ends of the keys, the upper edges of both of said strips being castellated to form projections which fit between the side walls of the keys in order to locate the keys against sideward movement, said fulcrum strip having a continuous stationary fulcrum rod secured along its upper edge, and the side walls of said keys being notched upwardly from the bottom edges to form bearings which receive said fulcrum rod.

11. A musical instrument comprising a keyboard made up of collaterally disposed hollow keys each having top and side walls, a stationary fulcrum strip and a stationary key guide strip each mounted edgewise beneath said keyboard in collateral spaced relation, the key guide strip being located near the ends of the keys, the upper edges of said strips being castellated to form projections which fit between the side walls of the keys in order to locate the keys against sideward movement, said fulcrum strip having a continuous stationary fulcrum rod secured along its upper edge, the side walls of said keys being notched upwardly from the bottom edges to form bearings which receive said fulcrum rod, said fulcrum strip having a thickness much greater than the diameter of said fulcrum rod and thereby bearing against the inside of the side walls of the keys despite said notches in said side walls, and the tops of the projections of said key guide strip being of suitable height to limit the maximum downward movement of the keys when fully depressed.

12. A key and hammer action for a toy piano, said action comprising a key with a rearward extension, means pivoting the same intermediate the extension and key, the free end of the extension extending upward and pivotally carrying a hammer the head end of which extends toward the key and above the extension, and the tail end of which extends beyond the pivot of the hammer, sound producing means disposed over said hammer, stop means disposed above the rear end of the extension and hammer, one of said extension and hammer having relatively rigid bearings and the other having a rigid pivot, said bearings being open at one side with a dimension slightly smaller than the diameter of the pivot, whereby the hammer and extension may be pressed into assembled relation with a snap fit.

13. A key and hammer action for a musical instrument, said action comprising a key with a rearward extension, fulcrum means pivoting the same intermediate the extension and key, the free end of the extension pivotally carrying a hammer the head end of which extends towards the key, and the tail end of which extends beyond the pivot of the hammer, sound producing means disposed over said hammer, and a stop bar disposed above the rear end of the extension and hammer, whereby when the key is in depressed position the tail bears against the stop bar, the proportioning and disposition of the parts being such that at the latter time the hammer head is not raised sufficiently to reach the sound producing means, and when the hammer head continues rising by inertia it strikes the sound producing means, one of said extension and hammer having a rigid pivot and the other of said extension and hammer having a relatively rigid bearing receiving said pivot, said bearing being open at one side with a dimension slightly smaller than the diameter of the pivot, whereby

the hammer and extension may be pressed into assembled relation with a snap fit.

14. A key and hammer action for a musical instrument, said action comprising a key with a rearward extension, fulcrum means pivoting the same intermediate the extension and key, the free end of the extension pivotally carrying a hammer the head end of which extends towards the key, and the tail end of which extends beyond the pivot of the hammer, sound producing means disposed over said hammer, and a stop bar disposed above the rear end of the extension and hammer, whereby when the key is in depressed position the tail bears against the stop bar, the proportioning and disposition of the parts being such that at the latter time the hammer head is not raised sufficiently to reach the sound producing means, and when the hammer head continues rising by inertia it strikes the sound producing means, one of said extension and hammer having a rigid pivot and the other of said extension and hammer having a relatively rigid bearing receiving said pivot, said bearing being open at one side with a dimension slightly smaller than the diameter of the pivot, whereby the hammer and extension may be pressed into assembled relation with a snap fit, said key having side walls with fulcrum holes and notches leading convergently upwardly from the bottom of said walls to said holes whereby the key may be pressed downwardly over said fulcrum means with a snap fit.

15. A key and hammer action for a toy piano, said action comprising a key with a rearward extension, rounded fulcrum means pivoting the same intermediate the extension and key, the free end of the extension being bifurcated and pivotally carrying between the extensions thereof a hammer the head end of which extends toward the key, and the tail end of which extends beyond the pivot of the hammer between the bifurcations of the extension, sound producing means disposed over said hammer, a stop bar disposed above the rear end of the extension and hammer, whereby when the key is in depressed position the extension and the tail bear against the stop bar, the proportioning and disposition of the parts being such that at the latter time the hammer

head is not raised sufficiently to reach the sound producing means, and when the hammer head continues rising by inertia it strikes the sound producing means, and the bifurcations of said extension having rigid bearings which are opened with the opening converging toward said bearings to a reduced dimension so slightly smaller than the bearing that the pivot may be pressed into the bearing with a snap fit.

16. In a toy piano, a slender generally cylindrical fulcrum or pivot having a horizontal axis and extending for the length of the key board, an upright support member disposed beneath said fulcrum for supporting the same along its length, and a plurality of hollow molded plastic piano keys each having a main horizontal top wall, a front wall, and side walls, all of said walls being integrally molded out of a suitable molding plastic in a single molding operation, said side walls having circular fulcrum holes dimensioned to fit said fulcrum, and upright notches in said side walls leading upwardly from the bottom edges of said side walls to said holes, said notches converging toward the holes to a size somewhat smaller than the diameter of the fulcrum, whereby said key may be pressed downwardly over said fulcrum with a snap fit, the snap fit resulting solely from the resilience of the material of the side walls themselves.

JEROME D. ENOCHS.
ROY M. BROWN.

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TOY PIANO

Filed May 11, 1950

2 Sheets-Sheet 1

FIG. 1.

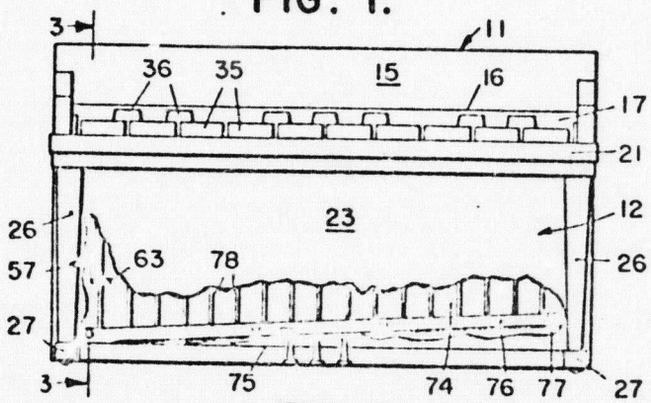


FIG. 2

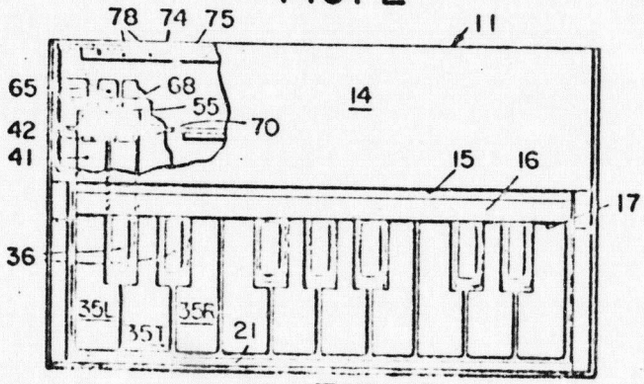
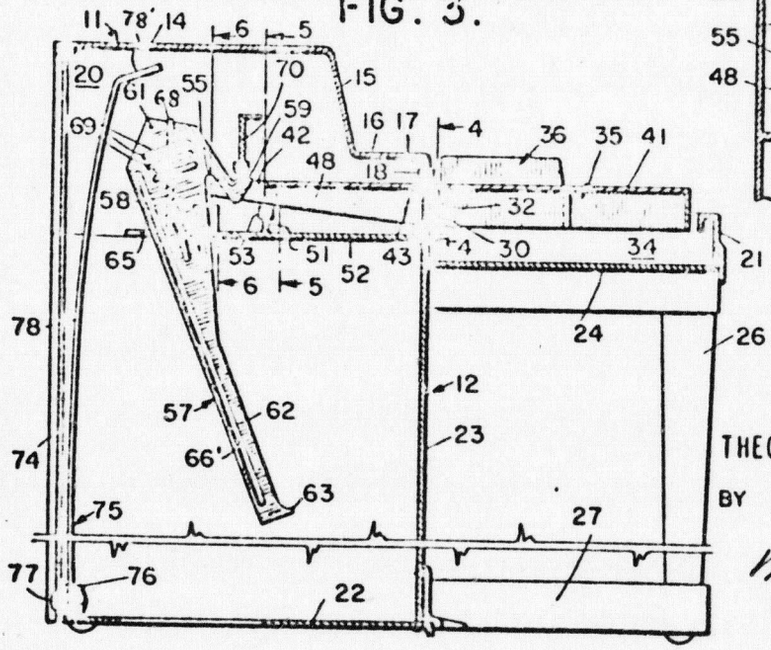


FIG. 3.



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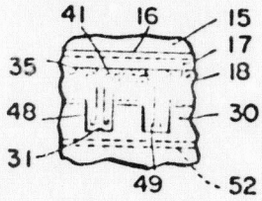

FIG. 5.

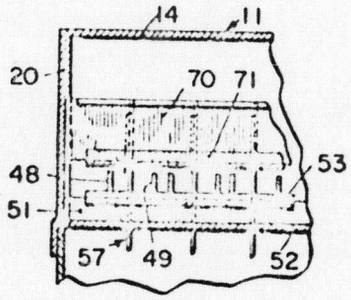

FIG. 6.

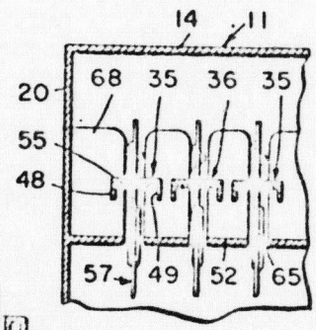

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FIG. 7.

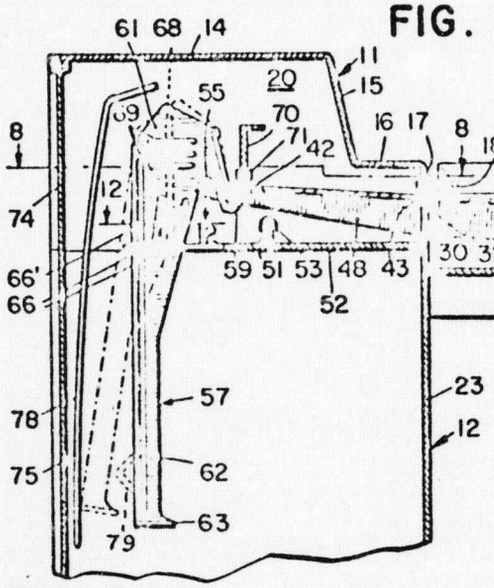


FIG. 12.

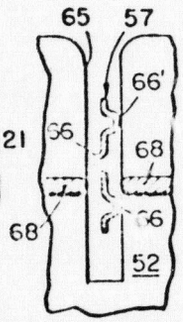


FIG. 9.

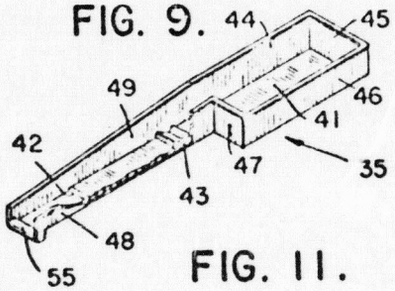


FIG. 8.

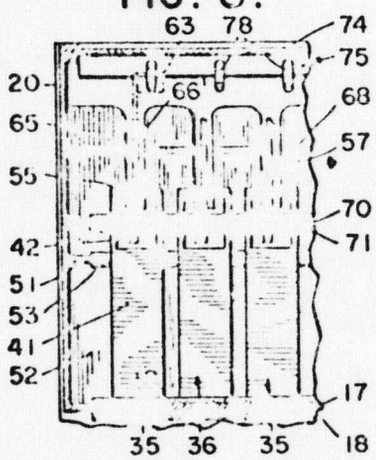


FIG. 10.

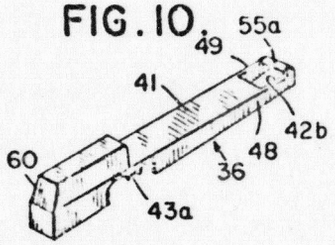


FIG. 11.

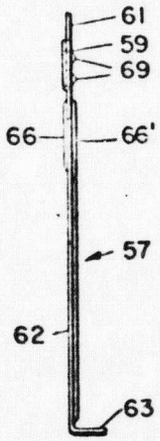


FIG. 13.

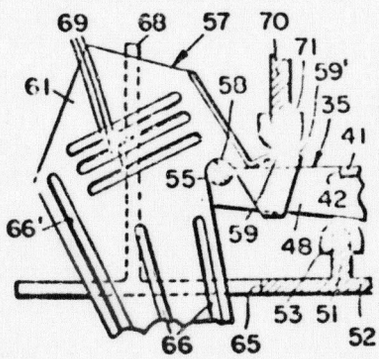
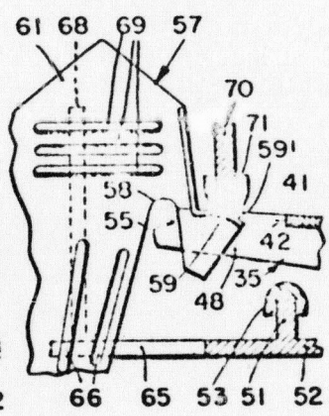


FIG. 14.



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TOY PIANO

Theodore R. Duncan, North Hollywood, Calif.

Application May 11, 1950, Serial No. 161,460

5 Claims. (Cl. 84—404)

This invention has to do in a general way with pianos and particularly with small toy pianos.

I am aware that there are several different types of toy pianos on the market, but those with which I am familiar are relatively heavy, expensive to manufacture, and give very poor musical tone. One particular objection to such pianos is the fact that the music-producing elements are extremely heavy and clumsy, requiring a strong, heavy case. Breakage in shipment is common, and this ultimately adds to the cost of the pianos. Another fault with presently manufactured toy pianos is the fact that the "action" thereof is slow, making it impossible to rapidly repeat the same note. A further disadvantage is that the commonly employed clapper-type of striking means permits no expression in the music, and the sound of the music is often partially drowned out by the scraping and clanking sound of the action.

Therefore it is an object of my invention to provide a novel, improved toy piano which does not have the above-noted disadvantages of toy pianos presently manufactured.

A particular object of the invention is to provide a relatively small and light-weight toy piano which can be manufactured cheaply.

Another particular object of the invention is to provide a toy piano, which, compared to known toy pianos, has improved musical tone, quieter, more efficient and more responsive action, and is lighter in weight and more compact.

Another object is to provide a toy piano, which, as an article of manufacture, has a minimum number of parts easily assembled by unskilled persons, embodies a minimum of materials, utilizes the lowest cost materials suitable for each part, and which is easy to package and, though lighter in weight than those heretofore manufactured, is relatively stronger and less subject to breakage in shipment.

A further object is to produce a toy piano which has, in miniature, a quality of tone more like that of a true pianoforte.

A still further object is to provide improved means for striking the vibrators which avoids all individual felting and yet which will operate more silently and efficiently than known striking means.

A further object is to provide a unit tone-producing member of relatively light weight and improved design with a substantially straight, or level striking point.

A further object is to provide improved means for distributing the weight of the sound-producing member over a large area or portion of the case.

A particular object of this invention is to provide improved and simplified means for multiplying the velocity of the striking means in toy pianos, such devices, due to complexity and high cost of manufacture, having heretofore been used only on expensive professional pianos. In this connection it is an object to provide an ideally counterbalanced striking lever.

Another object is to provide a means for employing vibrators of uniform cross section fixed at one end and free at the other.

These and other objects will be apparent from the drawings and the following description thereof.

Referring to the drawings, which are for illustrative purposes only:

Fig. 1 is a front elevational view, partly broken away, of a toy piano embodying the invention;

Fig. 2 is a plan view of the device of Fig. 1, the view being partly broken away to show portions in sections;

Fig. 3 is an enlarged sectional view on line 3—3 of Fig. 1;

Fig. 4 is a fragmentary section on line 4—4 of Fig. 3;

Fig. 5 is a section on line 5—5 of Fig. 3;

Fig. 6 is a fragmentary sectional view on line 6—6 of Fig. 3;

Fig. 7 is a fragmentary sectional view in the same plane as Fig. 3 showing the parts with the key depressed;

Fig. 8 is a section on line 8—8 of Fig. 7;

Fig. 9 is a perspective view, partly broken away, of a white key member shown inverted;

Fig. 10 is a perspective view, partly broken away, of a black key member;

Fig. 11 is an edge view of the front of a striking lever;

Fig. 12 is an enlarged sectional view on line 12—12 of Fig. 7;

Fig. 13 is an enlarged fragmentary view of the upper end of the striking lever in the plane and position of Fig. 3; and

Fig. 14 is an enlarged fragmentary view of the upper end of the striking lever in the plane and position of Fig. 7.

More particularly describing the invention, in the drawings I show a piano of the spinet type which has a case which may be conveniently formed in two parts of plastic or other suitable material. The upper part is indicated by numeral 11 and the lower part by numeral 12. The upper part includes a top wall which is formed to provide an upper flat top section 14, an inclined section 15, a ledge 16, and a depending front wall flange 17, the lower edge of which is covered with a strip of a resilient or rubber-like material 18 for a purpose to be described. The upper part also includes end walls 20. The end walls extend forwardly of the flange wall 17 on each side and terminate in a key-enclosing front wall 21.

The lower part of the case includes a front wall 23 and a forwardly extending key space defining wall 24. The lower part of the case is also formed to provide legs 26 and parts 27 between the legs and the front wall 12.

The front wall 23 of the lower part of the case extends upwardly above wall 24 and terminates in a plurality of fulcrum sections 30 which, as shown in Fig. 4, are defined by slots 31 in the wall. These fulcrum sections may be tapered or beveled at 32 to form a sharp edge as shown. The upper part of the wall 23, the forward extending wall 24, and the front wall 21 of the upper part of the case cooperate to define a key space 34 for reception of the outer ends of piano keys 35 and 36.

As in conventional pianos both long, or white keys, 35 and short, or black keys, 36 are provided. When viewed in plan the exposed portions of the white keys are conventionally shaped, that is, they are slightly L-shaped as the key 35L, slightly T-shaped as the key 35T, or slightly reversely L-shaped as the key 35R, the keys being arranged as found on a conventional keyboard but being fewer in number.

The white keys each are in the form of an elongated box-like structure. Referring to Fig. 9, a typical white key comprises a top wall 41, which is provided with an aperture or opening 42 at the inner end of the key. On the under surface of the top wall a bearing element 43 is formed at the point where the key is to be fulcrumed on one of the sections 30. Each key is provided with side walls such as those shown at 44, 45, 46, 47, 48,

and 49. The configuration of the key as a whole, of course, will conform to one of the three types previously described, that is, it will either be an L-shaped key, a T-shaped key, or a reversely L-shaped key.

The keys are mounted or fulcrumed on the rail section wall sections 30 and the side walls 48 and 49 of the keys are received in the slots 31. The lower edges of the side walls are inclined upwardly as best shown in Figs. 3 and 7. The side walls rest on a vertical supporting wall 51 which is formed as part of a rearwardly extending shelf 52 in the lower part of the case and serves to limit downward movement of the inner ends of the keys. The upper part of the stop wall 51 is covered with a strip 53 of a yieldable rubber-like material to provide a cushioning means for the keys.

Each key at its inner end is provided with a cross member 55 which may preferably be rounded or circular in cross section to support a striking lever, generally indicated by numeral 57. The striking levers are provided with a notch 58 which receives the pin-like cross member 55 of the key, each lever being provided with an arm 59 formed to project toward the outer end of the key and be received within the hole 42 therein.

As shown in Fig. 10, the black keys 36 are of the same width throughout, having an elevated front finger portion 60. These keys also have the fulcrum bearing, indicated by 43*a*, the pin-like cross member 55*a*, and the hole 42*b*.

Each striking lever is preferably relatively light in weight and may be made of thin sheet metal or formed of plastic or other suitable material. The levers each comprise a wider upper section 61 which tapers to a relatively narrow lower end portion 62. A striking head 63 is formed at the lower end as by a portion of the material extending at right angles to the body of the member. The previously mentioned arm 59 extends laterally of the main portion of the upper section 61 somewhat below the notch. To provide greater bearing area, the upper edge 59' of the arm may be turned as shown.

In order to guide the striking levers and maintain them parallel the shelf 52 is slotted at 65 to receive the levers and each lever is provided with suitable corrugations 66 to act as bearings in the slot. One corrugation, 66', extends to the lower end of the lever to form a strengthening rib. The shelf 52 is also provided with a plurality of vertical guide walls 68 between which the upper ends of the striking levers extend. The striking levers are provided with horizontally disposed corrugations 69 in the region of these walls to act as bearings.

The striking levers are thus guided to be maintained in parallel planes independently of the key members. Hence the key members can be moved laterally somewhat without causing any misalignment of the striking levers. Also, by using relatively wide guide slots with guide corrugations on the levers, assembly and manufacture are facilitated and friction is reduced. Each of the striking levers is suspended and normally hangs in the position shown in Figs. 3 and 13 by reason of the the fact that it is pivotally supported or hung at a point offset from its longitudinal axis. Above the striking levers there is provided a vertical wall 70 which may be formed as a part of the upper part 11 of the case. This wall is provided with a resilient edging strip 71 of rubber or rubber-like material, and the wall acts as an abutment for the upper edges of the arms 59 of the striking levers. This wall 70—71 also acts as a stop for limiting movement of the keys.

In the rear portion of the case is mounted a sounding board 74 which supports a sound-producing element 75. If the case is of a so-called plastic, I prefer to use a metal sounding board to distribute the weight of the element 75 over a large part of the case. This element may be a music comb having a base 76, secured to the sounding board by rivets 77, and a plurality of elongated vibrators 78 which are firmly mounted in the base and free at their other ends. These vibrators may be made of music wire and slightly curved as shown to provide clearance between them and the sounding board for vibrating. This curve may be the natural curve of wire from coils, the amount of curvature being controlled by the diameter of the coils supplied by the wire manufacturer. The longer vibrators may have bent ends 79 so that the case need not be made unduly high to accommodate them. The sounding board is shown as including a lower apertured wall section 22 which serves as a bottom wall for the case.

Heretofore, in toy pianos employing vibrators fixed at one end and free at the other, it has been necessary to utilize relatively large, heavy vibrators which had to be reduced in cross section adjacent to the member by which they were anchored in order to permit them to vibrate satisfactorily on a desired partial. The vibrators were thus weakened near their point of mounting and consequently subject to breakage. Also, they were relatively expensive and difficult to tune.

I find that by employing high velocity striking levers of relatively light weight with small area of contact with the vibrators and striking the vibrators at the right point I can use relatively light-weight, thin vibrators of uniform cross section throughout their length. As indicated above the vibrators may be made of music wire and I have found that a wire having a diameter of .043 inch gives excellent results if it is struck at a point about 26.8% of its length from the anchored end. This appears to cause the vibrators to vibrate chiefly in two sections, the so-called "partials," giving a good tone. While the point defined appears to give best results, the striking point may be varied somewhat to each side without producing unsatisfactory results.

To enable the use of striking levers of the same length since the vibrators vary in length, increasing in length from one end to the other, I mount the comb with the base thereof inclined as shown in Fig. 1. This results in the desired striking points of the vibrators being disposed substantially in level alignment.

Another feature of the invention is the fact that the pivotal connection or fulcrum mounting of the striking levers on the inner ends of the keys (the long bearing surface 51 extending across the keys) permits the striking levers to be equally spaced without the necessity of having the inner ends of the keys centrally aligned with the striking levers. The spacing of the keys is thus somewhat independent of the spacing of the striking levers. An advantage of this is that the crowding of keys in the three black key groups, due to having only three types of white keys, does not require a similar crowding of the striking levers, as the spacing of the levers is even, while that of the keys is uneven. I am thus enabled to use merely three types of white keys (35L, 35T and 35R previously described) although on professional-type pianos it is customary to use seven types of white keys. Also, by having equally spaced striking levers, the levers may have wider striking heads and more space in which to operate and yet all be the same.

In the operation of the device, when a key is struck and depressed, as shown in Figs. 7 and 14, the inner end of the key rises, carrying the striking lever upwardly with it. Since the abutment wall 70—71 engages the upper surface 59' of the arm 59 on the upper end of the striking lever, the upward movement of the inner end of the key causes the striking lever to turn about its pivotal axis of suspension and, as a result, the lower end of the striking lever is rapidly propelled toward and against its associated vibrator, as shown by the broken-line position of Fig. 7. The movement of the key is limited by the abutment 70—71. After striking its associated vibrator, the striking lever bounces off the vibrator and hangs in the position in which it is shown in Figs. 7 and 14 until the key is returned to its original position. The fact that the striking levers are relatively light in weight with most

the weight in the upper portion greatly contributes to the rapid action obtainable.

It will be apparent that the entire piano may be relatively light in weight with no unduly heavy parts which might tend toward breakage in transit. During shipment I may use a rod or bar of heavy paper, wood, or other material to hold the striking levers against movement. Such a bar, indicated by 79, is shown in broken lines in Fig. 7 and may extend through holes (not shown) in the ends of the case. The piano keys would be held depressed by any desired means in shipment.

Although the invention has been particularly shown and described, it is contemplated that various changes and modifications can be made without departing from the scope thereof as indicated by the following claims.

I claim:

1. In a piano, a case, a substantially horizontal key member pivotally supported intermediate its ends in said case for limited pivotal movement, a striking lever pivotally hung on the inner end of said key member and depending therefrom, said lever including an arm projecting toward the pivotal axis of said key member from the pivotal axis of the striking lever, said lever being relatively thin and flat and having a thin edged striking head transversely of its lower end, the lower end portion of said lever being lighter in weight than the upper end portion, guide means in said casing for holding said lever in a vertical plane, and an abutment in the path of and engageable by the arm of said striking lever upon movement of said lever with said key member.

2. In a piano, a case, a substantially horizontal key member pivotally supported intermediate its ends in said case for limited pivotal movement, a striking lever pivotally suspended on the inner end of said key member and depending therefrom, the pivotal axis of said striking lever on said key being offset from the longitudinal axis of the lever whereby the lever normally hangs at a substantial acute angle to the vertical, said lever including an arm projecting toward the pivotal axis of said key member and away from the longitudinal axis of the striking lever and an abutment in the path of and engageable by the arm of said striking lever upon movement of said lever with said key member, said abutment being so positioned that initial movement of the striking lever upon movement of said key member is in a direction such that the lower end of the striking lever swings downwardly toward the vertical.

3. In a piano, a case, an upright wall providing a plurality of fulcrum supports, a plurality of keys fulcrumed on said supports, means in said case limiting pivotal movement of said keys, a thin, substantially flat striking lever pivotally hung from the inner end of each key and having a lateral arm, said striking levers depending from said keys, an abutment engageable by the arms of said levers upon pivotal movement of the associated keys, and guide means in said case for maintaining said levers within narrow parallel planes, said means comprising a slotted shelf below the inner end portions of said keys receiving said levers and upright walls on said shelf between said slots.

4. In a piano, a case, a plurality of substantially horizontal key members, a plurality of striking levers pivotally suspended from the inner ends of the key members respectively, and wall means in said case defining guide slots for receiving said striking levers and maintaining them substantially parallel, said slots each being substantially wider than the thickness of the body of the individual levers, said levers having elongated convex bearing surfaces on their sides in the region of said slots for guiding the levers in said slots.

5. In a piano having a substantially horizontal key member mounted for limited pivotal movement about a horizontal axis intermediate its ends and having a striking lever abutment adjacent the inner end of said key member, the combination therewith of a striking lever comprising a thin, sheet-like body having an upper section formed to provide a downwardly facing notch at one side and an arm extending laterally of the notch, said lever being hung on the inner end of said key member by means of said notch with said arm positioned below said striking lever abutment, said striking lever body having a lower section terminating in a thin-edged, transversely extending striking head facing in a direction laterally opposite said arm, said lower section of said body being lighter than said upper section, said striking lever normally hanging from said notch substantially inclined with the lower end of the body relatively retracted.

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April 16, 1957 A. A. ANTHONY 2,788,608

XYLOPHONE WITH TOY DANCING FIGURES

Filed Sept. 9, 1953

Fig. 1

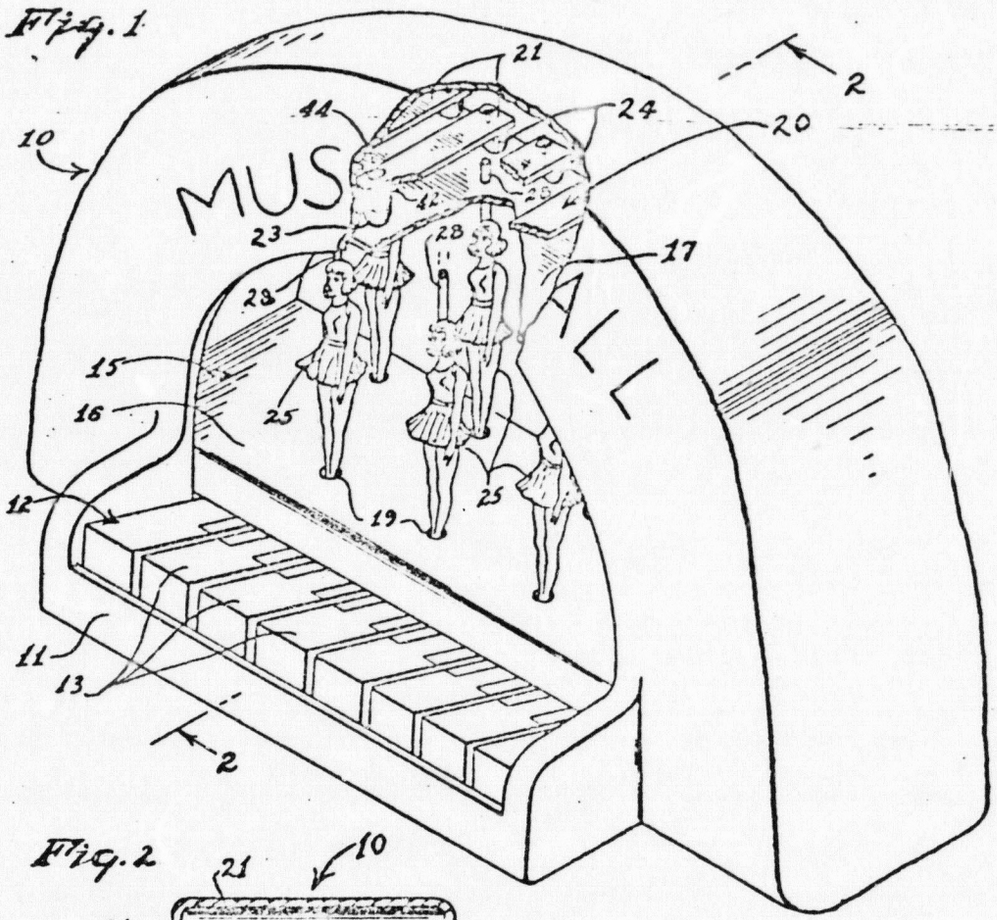


Fig. 2

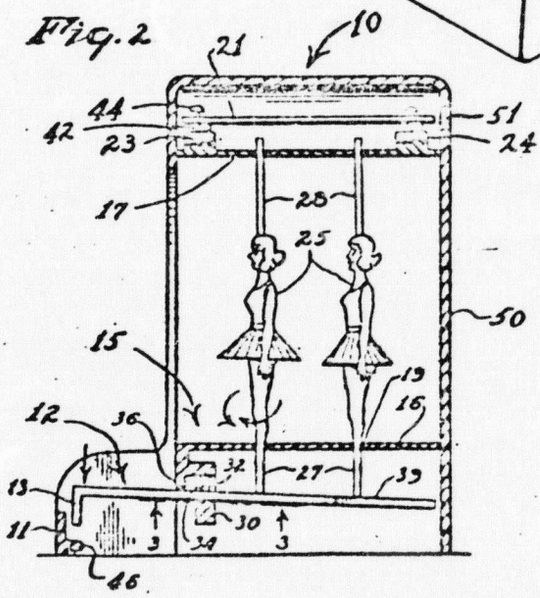
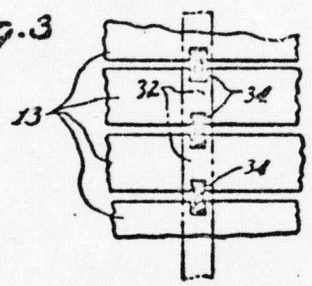


Fig. 3



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United States Patent Office

2,788,608

Patented Apr. 16, 1957

2,788,608

XYLOPHONE WITH TOY DANCING FIGURES

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Application September 9, 1953, Serial No. 379,151

5 Claims. (Cl. 46—118)

This invention relates to musical toys and more especially to a novelty xylophone.

It is an object of the invention to provide a xylophone which is played by striking keys, and which has a stage with dancing figures that move in response to the operation of the keys.

In the preferred form of the invention, dowels which strike against the xylophone plates support the dancing figures so that each figure moves as a unit with its associated dowel. In accordance with one feature of the invention, the dowels are loosely held in position and left free to rotate so that the up and down movement of the dancing figures is accompanied by a haphazard turning of the figures during the operation of the xylophone.

Other objects, features and advantages of the invention will appear or be pointed out as the description proceeds.

In the drawing, forming a part hereof, in which like reference characters indicate corresponding parts in all the views:

Figure 1 is a perspective view, partly broken away, of a musical toy embodying this invention;

Figure 2 is a sectional view taken on the line 2—2 of Figure 1; and

Figure 3 is an enlarged sectional view taken on the line 3—3 of the Figure 2.

The musical toy includes a housing 10 having a front wall 11 with a space behind it for a keyboard 12 comprising a plurality of keys 13. There are preferably eight keys so that the instrument can be used for playing a full octave.

Behind the keyboard there is a stage 15 having a floor 16 and a ceiling 17. There are openings 19 in the floor and ceiling, with the openings in the floor in alinement with corresponding openings in the ceiling.

A xylophone 20 is located in the housing above the ceiling 17. The xylophone 20 includes a plurality of plates 21 supported on a forward ridge 23 and a rearward ridge 24.

A plurality of dancing figures 25 is located on the stage. At the lower end of each of the figures 25 there is a downwardly extending dowel 27 which passes through one of the openings 19 in the floor of the stage. At the upper end of each of the dancing figures 25, there is a dowel 28 extending upwardly through one of the openings 19 in the ceiling of the stage. In the preferred construction, the downwardly extending dowels 27 and 28 are made as a single, one-piece element, and the dancing figures are molded around the mid portion of this dowel element.

The dowels 27 and 28 support the dancing figures in vertical positions, the dowels 27 and 28 are moveable up and down in the openings 19, and fit loosely in these openings 19 so that they are free to rotate. In the operation of the toy, the figures 25 move up and down with the dowels 27 and 28, and rotate in haphazard fashion to obtain variations in the movements of the dancing figures.

Each of the upwardly extending dowels 28 is located under a different one of the xylophone plates 21, and is in position to strike the xylophone plate as a hammer to play the xylophone when the dowels are operated by the keys.

Figure 2 shows the construction behind the keyboard and illustrates the way in which the dancing figures are operated by the keys. A ridge 30 extends downwardly from the floor 16 of the stage. There are openings 32 in this downwardly extending ridge, there being one opening 32 for each of the keys 13. At the sides of the openings 32, there are projections 34 (Figure 3) which extend into recesses in the sides of the keys 13. These projections 34 prevent longitudinal and transverse displacement of the keys 13, but leave each key free to rock on the lower side of the opening 32 through which it extends. There is a ridge 36 ahead of the ridge support 30 for limiting upward movement of the keys 13.

Each of the keys 13 has a rearwardly extending portion 39, behind the ridge 30, for supporting one of the dancing figures 25 and its associated dowels 27 and 28. In the preferred construction, the downwardly extending dowel 27 rests directly on the rearward portion of the key 13.

Figure 2 shows one of the xylophone plates 21 supported from the ridges 23 and 24 by felt pads 42 and held against displacement by pins 44 which extend through openings near opposite ends of the xylophone plates 21.

In its normal position, the upper end of the dowel 28 is spaced by a substantial distance from the xylophone plate 21. When the key 13 is depressed into contact with an abutment ridge 46 which limits downward movement of the keys, the upper end of the dowel 27 is close to, but still spaced some distance below the plate 21.

When the key 13 is depressed rapidly, the inertia of the dancing figure 25, and its associated dowels 27 and 28, causes the dowel 28 to strike the xylophone plate 21 as a hammer. After striking the plate, the dowel 28 moves downward, even though the key 13 is held down, leaving the xylophone plate free to vibrate with a clear note.

The xylophone 20 can be located in other positions in the housing, and the plates of the xylophone may be struck by other portions of the operating mechanism, but in the preferred construction the dowels 27 and 28 are used to serve the dual function of operating the dancing figures and acting also as the hammer elements for playing the xylophone.

The housing 10 has a back wall 50 which provides an attractive back wall for the stage and which conceals the inside of the housing below the stage. The back wall 50 has openings 51 into the xylophone compartment of the housing so that the sound from the xylophone escapes more easily from the housing. The back wall 50 can be made to terminate at the ceiling of the stage so that the xylophone chamber is entirely open at the back of the toy, but the extension of the back wall to the top of the housing has the advantage of bracing the top of the housing so that the toy can be made of thinner material. The preferred construction uses a molded plastic housing which is attractive in appearance and particularly well-suited for a musical instrument of this kind because the plastic reflects the sound and gives the xylophone a sharp and lively tone.

The preferred construction has been illustrated and described, but changes and modifications can be made without departing from the invention as defined in the claims.

What is claimed is:

1. A musical toy including a housing having a front wall and an open space behind the front wall for a row of keys, a stage behind the space for the keys, said stage having a floor and a ceiling, a row of keys located in the space provided between the front wall and the stage, a plurality of dancing figures on the stage, dowels attached to the upper and lower ends of the dancing figures and extending through the ceiling and floor, respectively, each of the dowels which extend through the floor of the stage being located in position to be moved up and down by the operation of a different one of the keys, and a xylophone located above the stage and having separate plates in position to be struck by the upper ends of the dowels which are connected with the upper ends of the different figures.

2. A musical toy including a housing having a row of keys, a stage, supports for a row of xylophone plates located above the stage, a plurality of dancing figures on the stage corresponding to the different keys, and motion transmitting connections through which each key operates an associated dancing figure, separate elements for striking the different xylophone plates, said elements being connected with the dancing figures.

3. A musical toy including a housing having a front wall, a keyboard comprising a row of keys located behind the front wall, a support on which the keys are pivoted for rocking movement, a stage behind the keys, the stage having a floor and ceiling, supports for xylophone plates located in the housing above the ceiling of the stage, a plurality of dancing figures on the stage corresponding to the number of keys and the xylophone plates, dowels extending upwardly and downwardly from the respective figures through the ceiling and floor, respectively, of the stage, each of the upwardly extending dowels being located under a different one of the xylophone plates and in position to strike the plate when moved upwardly, and each of the downwardly extending dowels contacting with a rearwardly extending portion of one of the keys of the keyboard.

4. A musical toy including a housing having a front wall, a keyboard located behind the front wall and comprising a row of keys, a ridge carried by the housing, behind the keyboard, and on which the keys rest, projections on the ridge engaging recesses in the sides of the keys for holding the keys against longitudinal and transverse displacement while leaving them free to rock about a horizontal axis, a stage in the housing behind a keyboard, the stage having a floor and ceiling, supports in the housing above the ceiling for xylophone plates, a plurality of xylophone plates carried by said supports and corresponding with the keys of the keyboard, dancing figures on the stage with dowels extending upwardly and downwardly from each of the dancing figures through openings in the ceiling and floor, respectively, of the stage, the upwardly extending dowels being located under the different xylophone plates and in position to strike the plates as hammers for operating the xylophone, and the downwardly extending dowels contacting with the top surface of rearwardly extending portions of the keys behind the ridge on which the keys are supported so that downward movement of any key pushes an associated dancing figure upwardly for bringing the dowel above that figure into contact with a corresponding xylophone plate.

5. A novelty xylophone including a housing having a keyboard comprising a plurality of keys, a support within the housing and on which the keys are supported, a xylophone carried by the housing and having a plurality of plates, a stage behind the keyboard, the stage having a floor with openings therein, a plurality of vertically reciprocating dancing figures on the stage with portions of the figures extending through the openings in the floor of the stage and into contact with rearwardly extending ends of the keys behind the support on which the keys rest so that operation of the keys moves the dancing figures up and down, the sides of the openings in the floor serving as guides for the reciprocating figures, and means associated with each key and connected with the respective figures in position to strike one of the plates of the xylophone in response to the operation of the key.

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July 16, 1957 O. J. ALVAREZ 2,799,196

ELECTRICAL MUSICAL INSTRUMENT

Filed Nov. 12, 1952 3 Sheets-Sheet 1

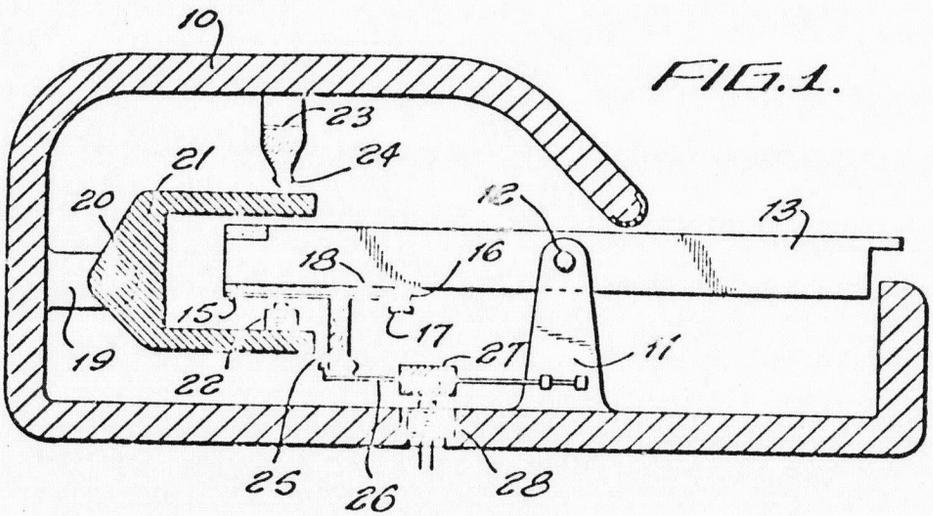

FIG. 1.

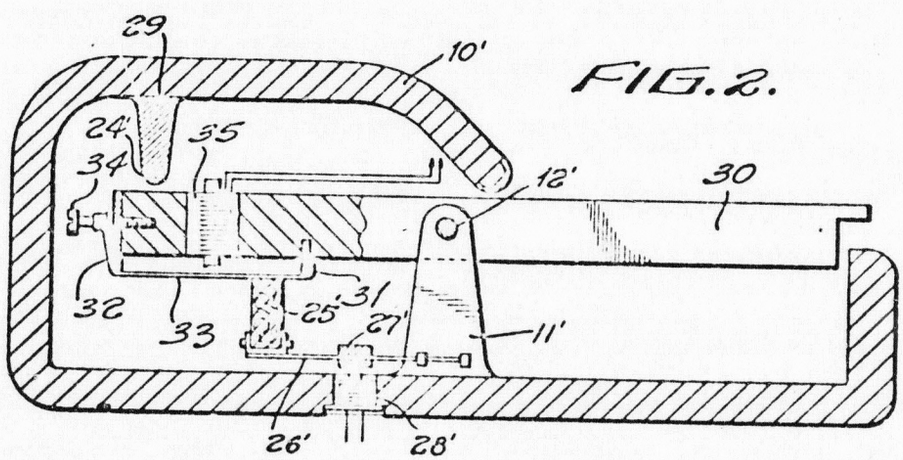

FIG. 2.

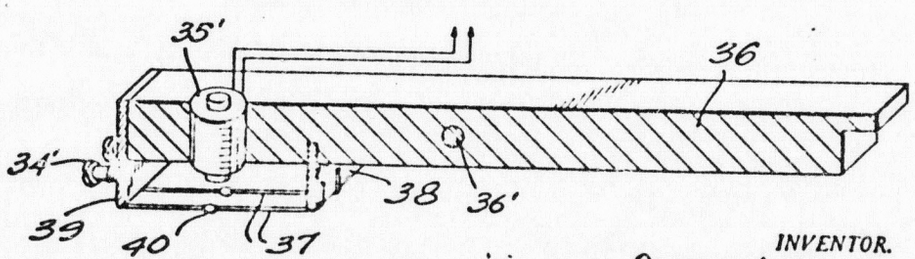

FIG. 3.

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ELECTRICAL MUSICAL INSTRUMENT

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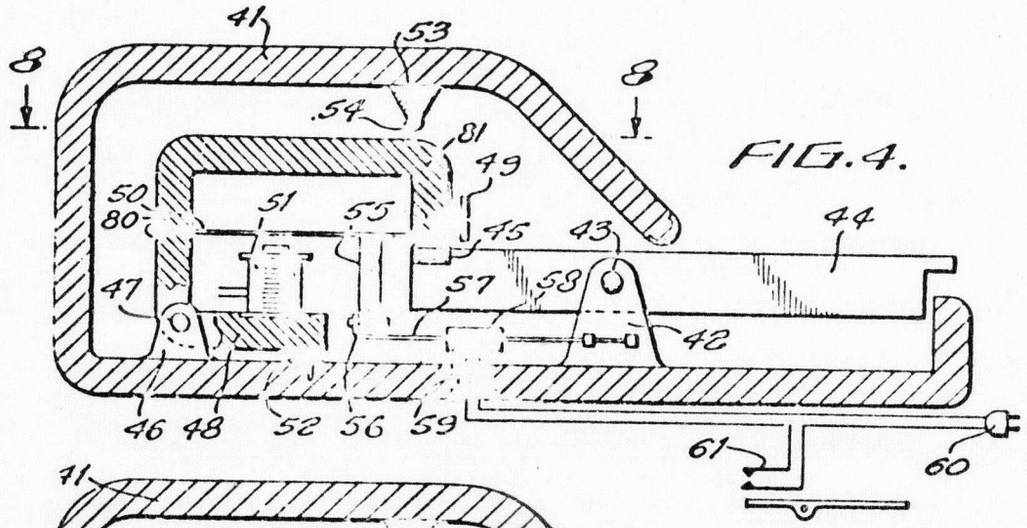

FIG. 4.

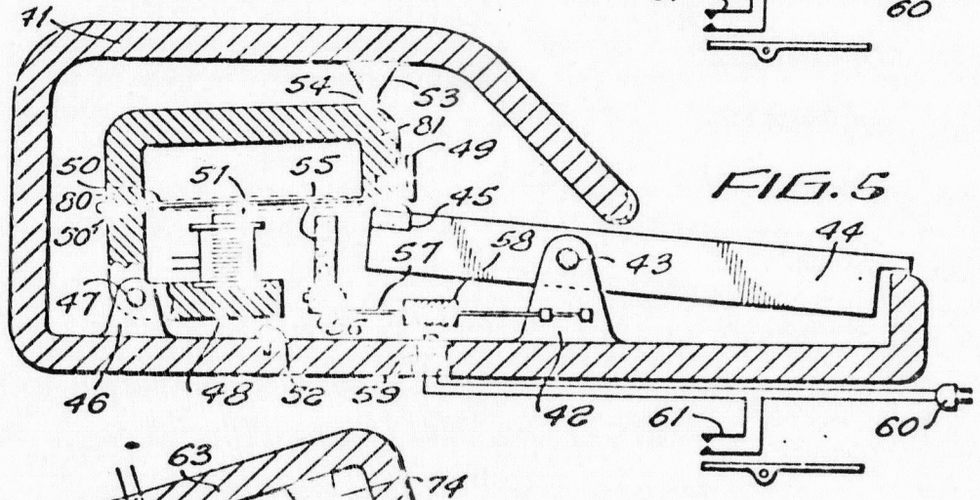

FIG. 5

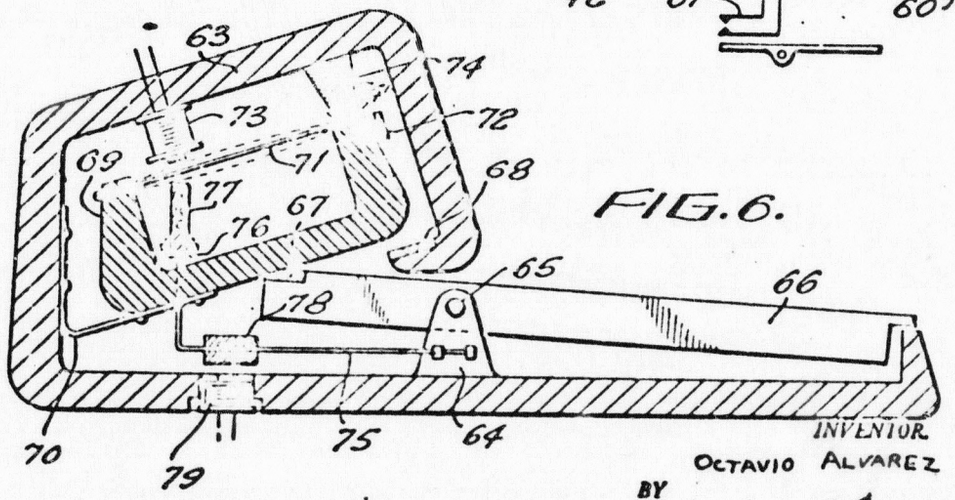

FIG. 6.

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ELECTRICAL MUSICAL INSTRUMENT

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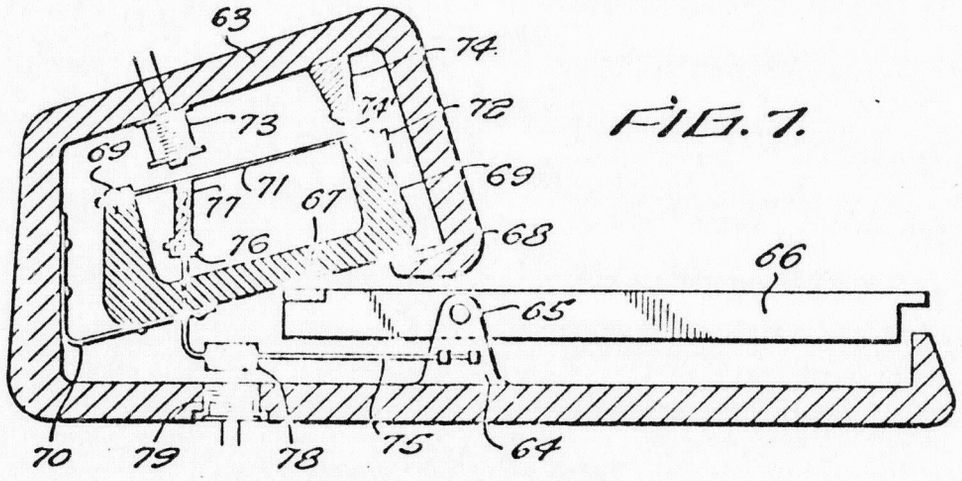

FIG. 7.

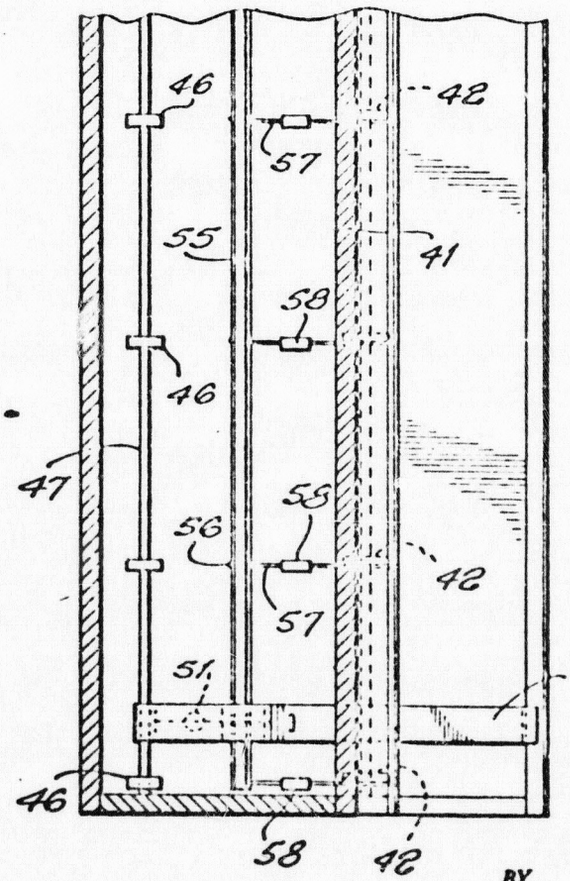

FIG. 8.

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2,799,196

ELECTRICAL MUSICAL INSTRUMENT

Octavio Jose Alvarez, New York, N. Y.

Application November 12, 1952, Serial No. 320,035

16 Claims. (Cl. 84—1.04)

The present invention relates to musical instruments and in particular to stringed instruments.

A structure similar to that of the present invention is disclosed in U. S. Patent No. 2,486,545. The structure of this patent produces the sound by a vibrating steel reed which is associated with two sets of stationary coils.

One of the objects of the present invention is to provide a musical instrument with vibrating strings and a means for electrically picking up the vibrations of the strings to transform these vibrations into audible sounds.

A further object of the present invention is to provide a single set of coils to pick up the vibrations of the strings both when an operating key or the like has been depressed and when it is released.

Another object of the present invention is to provide a means for mounting the coils so that they are always in a predetermined relation with respect to the vibrating strings.

A still further object of the present invention is to provide a means for varying the tension of the vibrating strings.

Yet another object of the present invention is to provide a means for increasing the amplitude of the vibrations of the strings.

An additional object of the present invention is to provide an instrument capable of accomplishing all of the above objects while at the same time being made of relatively few, simple, ruggedly constructed parts.

With the above objects in view, the present invention mainly consists of a musical instrument which includes a support structure and a carrier structure mounted on the support structure for movement between a rest position and an operating position. A stop means is mounted on the support structure adjacent to the carrier structure and engages the latter when the carrier structure moves from its rest to its operating position, so as to impart vibrations to the carrier structure. An elongated vibrating member is fixed to the carrier structure and has two spaced points engaging the latter, this vibrating member being free between the spaced points thereof so as to vibrate between these points when the carrier structure strikes against the stop means upon movement of the carrier structure to its operating position. A pick-up means is provided on the carrier structure or the support structure and is located adjacent to the elongated vibrating member to pick up the vibrations thereof and transmit the same to an apparatus for changing the vibrations into an audible sound.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a side, sectional, partly diagrammatic view of one possible apparatus for carrying out the present invention;

Fig. 2 is a partly diagrammatic, side, sectional view of another apparatus for carrying out the present invention;

Fig. 3 is a side, sectional view of a different embodiment of a part of the structure of Fig. 2;

Fig. 4 is a partly diagrammatic, side sectional view of still another embodiment of the present invention;

Fig. 5 illustrates the structure of Fig. 4 in a position different from that shown in Fig. 4;

Fig. 6 is a partly diagrammatic, side sectional view of a still further embodiment of the present invention;

Fig. 7 illustrates the structure of Fig. 6 in a position different from that shown in Fig. 6; and

Fig. 8 is a partly diagrammatic plan view taken along the line 8—8 of Fig. 4 in the direction of the arrows.

Referring now to the drawings, Fig. 1 shows a support 10 which e. g. extends horizontally along the length of a piano, or the like, this support 10 being shown in a transverse, vertical, sectional view in Fig. 1. In Fig. 1 is shown one of a plurality of key assemblies of an electrical musical instrument of the keyboard type. At spaced points along the length of the support 10 there are a number of stationary ears 11 which carry an elongated rod 12 extending along almost the entire length of the support 10. A plurality of elongated members in the form of keys 13, e. g. equal in number to the number of keys of a standard key board, are turnably mounted between their ends on the rod 12, as illustrated, these keys being located in side by side relation along the rod 12 and each having an outer free end portion accessible through an opening in the support 10 to the fingers of the operator of the instrument. Thus, ears 11 and rod 12 form a mounting means mounting each elongated member 13 for pivotal movement.

At its inner free end portion, each key 13 has fixed to its underside a pair of rigid members 15 and 16 forming a pair of string supporting means, and a screw 17 threadedly engages the member 16. An elongated vibrating member in the form of a stretched string 18 is fixed at one end to the member 15 and at its opposite end to the screw 17 so that the tension of string 18 may be adjusted by turning of screw 17. The several strings 18 which are respectively located on the keys 13 may vary as to length, thickness, and tension in proportion to conventional piano strings. The strings 18 may be made of a magnetic metal for a purpose to be described below.

A number of stationary ears 19 are located along the support 10 and are fixed to the inner rear face thereof, these ears 19 carrying an elongated rod 20 which extends along almost the entire length of the support 10. A plurality of C-shaped members 21 are turnably mounted on the rod 20, as shown in Fig. 1, and are equal in number to the number of keys 13 and located in side by side relation along the rod 20 respectively in alignment with the several keys 13. Each of the C-shaped members 21 includes an upper and a lower arm respectively located on opposite sides of the inner free end portion of the key 13 aligned therewith.

As is apparent from Fig. 1, the lower arm of the C-shaped member 21 is located at a greater distance from the key 13 than the upper arm of member 21, and an electrical pick-up means in the form of a coil 22 is fixedly mounted on this lower arm and is located closely adjacent to the string 18. Each of the members 21 is provided with a coil 22, and these coils are all electrically connected to an amplifier and loud speaker (not shown), in the same way as the coils shown in U. S. Patent Number 2,486,545.

An elongated stop bar 23 forms an abutment means and is fixed to the underside of the top part of the supporting casing 10, this bar 23 extending along almost the

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entire length of the support 10. A strip of elastic material such as felt or the like 24 is fixed to the bottom side of the bar 23. Thus, upon turning of a key 13 in a clockwise direction about rod 12, as viewed in Fig. 1, the inner free end portion thereof will engage the top arm of the C-shaped member 21 and turn the latter in a counterclockwise direction, as viewed in Fig. 1, until the top arm thereof strikes against the bar 23 so as to transmit vibrations through the member 21 and key 13 to the string 18 mounted on the latter. It will be seen that the coil 22 moves with the member 21 so as to be located close to the vibrating string 18 to pick up and transmit the vibrations thereof to an apparatus for changing these vibrations into an audible sound. Thus, the members 13 and 21 form a carrier structure for the string 18 and coil 22, this carrier structure being movable from the rest position illustrated in Fig. 1 to an operating position where the C-shaped member 21 engages stop bar 23 to set up vibrations in the string 18.

A damping means is associated with the strings 18 for damping the vibrations thereof. This damping means takes the form of an elongated strip 25 of felt or the like which extends along the entire length of support 10 beneath the strings 18. The strip 25 is carried by wire springs 26 which are respectively fixed to the ears 11 so as to urge the strip 25 to the position shown in Fig. 1 where it engages the strings 18 to damp out the vibrations thereof when the parts resume their rest position shown in Fig. 1.

A member 27 of a magnetic material is fixed to each of the springs 26, and an electromagnet 28 is located beneath each member 27, these electromagnets being mounted in the bottom wall of the casing 10 and being electrically operable, in a manner described below, by a pedal of the instrument. This structure forms an electromagnetic means for controlling the damping means. When this pedal is depressed, the electromagnets 28 are energized and attract the members 27 so as to move springs 26 downwardly to locate the strip 25 at a position lower than that shown in Fig. 1. In this way, the vibration of strings 18 will not be damped when the electromagnets 28 are energized, so that the vibrations of strings 18 will be continued to produce a long, drawn out tone.

Fig. 2 of the drawings illustrates a different embodiment of a key assembly of the invention which is in all respects the same as that of Fig. 1 except for the features which are now described. As is apparent from Fig. 2, the C-shaped member 21 and the parts 19 and 20 associated therewith are eliminated. Instead, the abutment means in the form of stop bar 29, identical with stop bar 23, is located directly over the inner end portions of the elongated members or keys 30 to engage the latter and directly set up vibrations in the same, stop bar 29 carrying a strip 24' of elastic material similar to strip 24. A pair of plates 31 and 32 are fixed to each of the keys 30 of the embodiment of Fig. 2, these plates forming a pair of string supporting means spaced longitudinally of member 30, and a string 33 is fixed at one end to plate 31, extends around the lower edge of plate 32, and is jointed to a tuning screw 34 which passes through the plate 32 and threadedly engages a threaded bore in the key 30 so that the tension of string 33 may be adjusted by turning of screw 34. Thus, string 33 is stretched and extends between the pair of supporting means 31 and 32. A coil 35 is mounted directly on each key 30 opposite the free portion of string 33 located between the points thereof which engage the plates 31 and 32, so as to pick up the vibrations of the string 33 and transmit the same in the same way as was described above. Coil 35 thus forms a pick-up means carried by member 30 adjacent string 33, with a portion of pick-up means 35 located between the pair of supporting means 31 and 32. Except for these features, the structure of Fig. 2 is the same as that of Fig. 1, and it is evident that upon depression of the key 30, it will strike the bar 29 to produce vibrations in the string 33 which will be picked up by the coil 35. A damping or string engaging means 25', 26' and an electromagnetic means 27', 28' for moving this damping means, identical with those of Fig. 1, are associated with the strings 33, as shown in Fig. 2. Fig. 2 also shows the support 10' and the mounting means 11', 12' pivotally mounting member 30 between its ends for turning movement about a predetermined axis. String 33 and the pair of supporting means 31 and 32 therefor as well as abutment means 29, 24' are all located on the same side of this axis, the abutment means being located opposite an upper face of member 30 adjacent an end of the latter.

Fig. 3 of the drawings shows a different type of string arrangement adapted to be used with the keys 36 identical with key 30. According to Fig. 3, a pair of strings 37 are each fixed at one end to a supporting means in the form of a plate 38 fixed to and extending from the underside of elongated member or key 36. These strings 37 extend about the lower edge of another supporting means in the form of a plate 39 fixed to the end of key 36, and each string 37 is connected to a tuning screw identical with screw 34 of Fig. 2. A weight 40 is mounted on each of the strings 37 to increase the amplitude of the vibrations thereof. Fig. 3 shows the pivotal mounting means 36', the pick-up means 35', and the tuning means 34'. Thus, when the structure of Fig. 3 is used, in the apparatus of Fig. 2, for example, the vibrations picked up by the coil will be the combined vibrations of two strings, and moreover the amplitude of these vibrations will be increased by the weights 40. It is to be understood that the feature of providing a plurality of strings in association with one key and the feature of providing a weight on a string are usable with the embodiments of Figs. 1 and 2, as well as with the further embodiments of the invention described below.

Fig. 4 of the drawings illustrates a further embodiment of a key assembly of the invention which includes an elongated support 41 similar to the support 10 described above. A number of ears 42 are fixed to the bottom wall of support 10 above the length thereof and carry a rod 43 on which the keys 44 are pivotally mounted. Each key 44 carries at its inner end portion a cushion member 45.

A number of additional ears 46 are fixed to the bottom wall of the support 41 and carry a rod 47 upon which a plurality of C-shaped elongated members 48 are turnably mounted, these members 48 being equal in number to the number of keys 44 and being respectively aligned therewith. Thus elements 46 and 47 form a mounting means turnably mounting the elongated member 48. Each member 48 is provided with a top arm having a downwardly extending free end located in engagement with the cushion 45 and threadedly carrying a tuning screw 49. A string 50 is connected to this tuning screw, extends about the free end of the top arm of member 48 and is fixed to the latter after passing through hole 50' at a point opposite this free end of the top arm thereof to provide string 50 with a free portion which is adapted to vibrate. The portions 80 and 81 of member 48 thus form a pair of string supporting means spaced longitudinally of member 48 and located at the ends thereof. A coil 51 forms a pick-up means carried by member 48 and is fixed to the lower arm of each member 48 and located closely adjacent to the string 50 to pick up the vibrations thereof and transmit the same to a sound producing apparatus, in the same way as was described above. The support 41 carries a rest 52 which engages the underside of member 48 when the parts are in the rest position shown in Fig. 4.

A stop bar 53 forms an abutment means and is fixed to the underside of the top wall of support 10 and extends over all of the members 48, this bar 53 being provided with an elastic strip of felt or the like 54 along its under surface. Thus, upon depression of key 44, the C-shaped member 48 aligned therewith turns to the position shown in Fig. 5 and strikes against the stop bar

53 to set up vibrations in the string 50 which are picked up by the coil 51.

A damping means identical with that described above is provided to damp out the vibrations of the strings 50. This damping means includes the elongated strip 55 of felt or the like mounted on a channel member 56 which is carried by a number of wire springs 57 fixed to the ears 42 (Fig. 8). Only one key 44 and its associated structure is shown in Fig. 8 for the sake of clarity. The springs 57 urge the strip 55 to the position shown in Figs. 4 and 5 so that the strings 50 engage the strip 55 when the parts are located in the position of Fig. 4 so as to thereby damp out the vibrations of the strings 50.

A number of magnetic members 58 are respectively mounted on the springs 57, and a number of electromagnets 59 are located in the bottom wall of support 41 respectively beneath the members 58. Elements 58 and 59 form an electromagnetic means for controlling the string engaging or damping means 55—57. The coils of electromagnets 59 are connected to a source of electricity through a plug 60, and the circuit of these coils includes a switch 61 operable by a foot pedal 62 which, upon being depressed, closes the switch 61 to complete a circuit through the electromagnets 59 which thereby attract the members 58 and pull the springs 57 and the strip 55 therewith to a position lower than that shown in Figs. 4 and 5, so that when the parts are in the position of Fig. 4, the vibrations of the strings 50 will not be damped and the tone produced thereby will be continued and drawn out. The parts 69—62 described above are associated with the electromagnets 28 of the embodiments of Figs. 1 and 2 to operate the same in exactly the same way.

A further embodiment of the invention is illustrated in Figs. 6 and 7 where the elongated support 63 carries ears 64 spaced along its length. Bar 74 carries an elastic strip 74' of felt or the like. A rod 65 is supported by the ears 64, and the keys 66 are pivoted on the rod 65, each key 66 having at its inner end a cushion member 67. A cushion member 68 is also provided on the support 63.

A plurality of upwardly directed C-shaped members 69 are each carried by a leaf spring 70 which is fixed to the inner rear face of support 63 and urges the members 69 to the position shown in Fig. 7 where they abut against the cushion 68 and maintain the keys 66 in the horizontal position illustrated in Fig. 7. A string 71 is fixed to the left free end of each member 69, as viewed in Figs. 6 and 7, and extends across the same and about the opposite free end thereof where each string 71 is connected to a tuning screw 72 threadedly engaging the member 69 and being turnable to adjust the tension of each string 71.

A stationary pick-up coil 73 is mounted on the under surface of the top wall of support 63 in close proximity to the several strings 71, respectively, as is evident from Figs. 6 and 7. Also, a stop bar 74 is mounted on the underface of the top wall of support 63 opposite the right free end of member 69, as viewed in Figs. 6 and 7, so that when the key 66 is depressed, as shown in Fig. 6, the member 69 engages stop bar 74 to transmit vibrations to the string 71 which are picked up by the coil 73 and transmitted to an apparatus for changing the vibrations to an audible sound. The coils 73 are located close enough to the strings 71, when the parts are in the rest position shown in Fig. 7, to pick up the vibrations thereof after the key 66 is released.

A number of elongated wire springs 75 are respectively fixed to the several ears 64, two of these springs respectively being located at opposite ends of the row of C-shaped members 69 and the others of these wire springs each extending upwardly through a pair of adjacent members 69. The several springs support an upwardly directed, elongated channel member 76 which extends along almost the entire length of the support 63 and which carries the felt strip 77 which engages the strings 71 when the parts are in the position shown in Fig. 7.

A number of magnetic numbers 78 are respectively mounted on the springs 75, and a number of electromagnets 79 are respectively located beneath the members 78 to attract the latter when the electromagnets 79 are energized so as to draw the springs 75 and the felt strip 77 therewith down to a position below that shown in Figs. 6 and 7 so that when the parts are in position of Fig. 7 the vibrations of the strings 71 will not be damped and the tone will therefore continue and be drawn out. The electromagnets 79 are energized by a structure identical with the parts 69—62 of Figs. 4 and 5. Thus, the embodiment of Figs. 6 and 7 is capable of accomplishing the same results as the above-described embodiments of the invention, although the pick-up coils 73 remain stationary.

It will be seen that in all embodiments of the invention the strings are shorter than the keys.

In the description above and in the claims which follow, the term "string" is intended to signify a metallic string for musical stringed instruments.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of musical instruments differing from the types described above.

While the invention has been illustrated and described as embodied in musical stringed instruments, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. An electrical musical instrument of the keyboard type having a plurality of key assemblies at least one of which comprises an elongated member, mounting means mounting said member for turning movement, a pair of string supporting means on said member spaced longitudinally thereof, a stretched string extending between said pair of supporting means, abutment means adjacent a portion of said member spaced from said mounting means and adapted to be contacted by said member during turning movement thereof, and electrical pick-up means on said member adjacent said string.

2. A musical instrument as recited in claim 1, wherein said abutment means is located adjacent an end portion of said member.

3. A musical instrument as recited in claim 1, said instrument including damping means located adjacent said string for damping vibration thereof.

4. A musical instrument as recited in claim 1, wherein a portion of said pick-up means is located between said pair of string supporting means.

5. A musical instrument as recited in claim 1, wherein a weight is carried by said string for influencing the vibration thereof.

6. A musical instrument as recited in claim 1, said elongated member having upper and lower faces and said abutment means being directed toward one of said faces adjacent an end of said member.

7. A musical instrument as recited in claim 1, wherein a string engaging means is located adjacent said string between said pair of supporting means for engaging a portion of the string located between said pair of supporting means.

8. A musical instrument as recited in claim 1, wherein said abutment means is made at least in part of elastic material.

9. A musical instrument as recited in claim 1 and wherein said pick-up means is located between said pair of supporting means substantially nearer to one of said pair of supporting means than the other.

10. A musical instrument as recited in claim 1, wherein said member is a manually operable key and has a front end portion capable of being turned downwardly by the operator in order to cause said key to approach and engage said abutment means.

11. A musical instrument as recited in claim 10 and wherein said key has a pair of end faces and said mounting means is connected to said member between said end faces thereof.

12. A musical instrument as recited in claim 10, wherein said key is pivotally supported intermediate its ends.

13. A musical instrument as recited in claim 1, wherein said pair of string supporting means are respectively located at the ends of said elongated member.

14. A musical instrument as recited in claim 1, wherein said member is a manually operable key and wherein said mounting means pivotally supports said key intermediate its ends for turning movement about a predetermined axis, said pair of supporting means being located on one side of said axis.

15. A musical instrument as recited in claim 14, wherein said abutment means is located adjacent an end of said key.

16. A musical instrument as recited in claim 15 wherein said abutment means is located on the same side of said axis as said pair of supporting means.

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537 037

Alexander Bienengräber in Dessau

Musikinstrument

Patentiert im Deutschen Reiche vom 26. August 1931 ab

Gegenstand der Erfindung ist ein Musikinstrument, bei dem beweglich gelagerte Klangkörper mittels Tasten mit nachgiebig gelagerten und um eine Welle kreisenden Hämmern in Berührung gebracht werden. Bei bekannten Musikinstrumenten dieser Art waren die Anschlaghämmer durch Federn mit der rotierenden Hammerwelle verbunden, was den Nachteil hatte, daß die Anschlagkugeln nicht richtig geführt wurden. Abgesehen davon, daß nicht alle Federn gleichmäßig arbeiten können, so daß der Anschlag der einzelnen Kugeln verschieden sein muß, war die Größe der von den Kugeln zurückgelegten Kreisbahn abhängig von der Umdrehungsgeschwindigkeit, so daß die Berührung der Kugeln mit den Klangkörpern nicht in der für die Klangwirkung richtigen Weise erfolgen konnte. Zudem wurde auf diese Weise ein schleifender Anschlag erzeugt, der unklare Töne zur Folge hatte.

Diese Nachteile werden erfindungsgemäß dadurch vermieden, daß die Hämmer oder Anschlagkugeln mittels reichlich bemessener Bohrungen auf mit der Welle umlaufenden Haltern gelagert sind, so daß sie unter dem Einfluß der Fliehkraftwirkung eine zwangsläufig vorgeschriebene Kreisbahn durchlaufen müssen, aus der sie erst beim Auftreffen auf den Klangstab so weit abgelenkt werden, als die Weite der Bohrung das gestattet. Durch diese Anordnung werden nicht nur die eingangs gekennzeichneten Nachteile vermieden, sondern es wird zudem noch der Vorteil gewonnen, daß durch die Wahl beliebiger Umdrehungsgeschwindigkeiten der Welle die Dynamik des Spieles in beliebigen Grenzen den künstlerischen Anforderungen angepaßt werden kann. Bei den bekannten Ausführungen hingegen durfte eine bestimmte, durch die Federn und durch das Gewicht der Anschlagkugeln bedingte Umdrehungsgeschwindigkeit nicht überschritten werden, da sonst die Klangstäbe nach unbeabsichtigt berührt und zum Erklingen gebracht wurden.

In der Zeichnung ist ein Ausführungsbeispiel der Erfindung dargestellt, und zwar zeigt

Abb. 1 einen senkrechten Schnitt,

Abb. 2 eine Draufsicht auf die Mechanik eines Instrumentes gemäß der Erfindung.

Durch die Pedale a und a_1 wird ein Schwungrad b und die mit diesem verbundene Hammerwelle c in Bewegung gesetzt. Die mit der Welle c bewegten runden Hämmer d sitzen mit übermessenen Bohrungen radial frei beweglich auf Achsen e, so daß die Hämmer je nach der Umdrehungsgeschwindigkeit sich unter Wirkung der Zentrifugalkraft mehr oder weniger nach außen bewegen können. f sind die Tonstäbe, die durch Tasten g gegen die rotierenden Hämmer d geführt werden. Durch Anschlagen der Taste g wird der durch den beweglichen Stift h mit der Taste g verbundene Arm des Hebels i heruntergedrückt. Der sich hierdurch hebende andere Arm des Hebels i drückt den sich um die Lagerstelle k drehenden Tonstabhalter l mit dem auf Strohpolster m o. dgl. liegenden Tonstab f gegen die rotierenden Hämmer d. Nach Freilassen der Taste g springt das durch das Gegengewicht n ausgeglichene System wieder in die Ausgangsstellung zurück. Die Hämmer d springen beim Auftreffen auf den Tonstab zurück, so daß ein klarer Ton entsteht. Durch diesen sich in rascher Folge wiederholenden Vorgang ertönen die angeschlagenen Töne so lange, wie die betreffenden Tasten niedergedrückt bleiben. Die gewünschte Tonstärke ist durch die Pedale regelbar, indem durch langsameres und schnelleres Treten die Hammerwelle langsamer oder schneller umläuft, so daß die Hämmer mehr oder weniger scharf gegen die Tonstäbe anschlagen.

Patentanspruch:

Musikinstrument, bei dem beweglich gelagerte, stabförmige Klangkörper mittels Tasten mit nachgiebig gelagerten und um eine Welle kreisenden Hämmern in Berührung gebracht werden, dadurch gekennzeichnet, daß die Hämmer (d) mittels reichlich bemessener Bohrungen auf mit der Welle (c) umlaufenden Haltern (e) gelagert sind, so daß sie unter dem Einfluß der Fliehkraftwirkung zwangsläufig vorgeschriebene Kreisbahnen durchlaufen müssen, aus denen sie erst beim Auftreffen auf den Klangstab (f) so weit abgelenkt werden, als die Weite der Bohrung dies gestattet.

Hierzu 1 Blatt Zeichnungen

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Zu der Patentschrift 567 657
Kl. 51 b Gr. 40

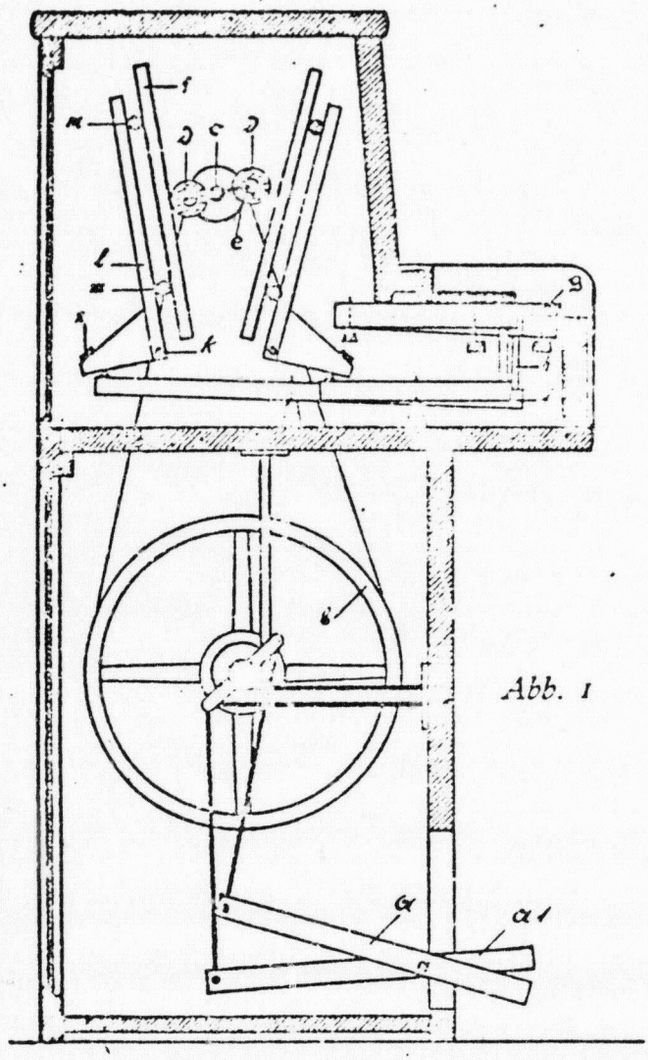
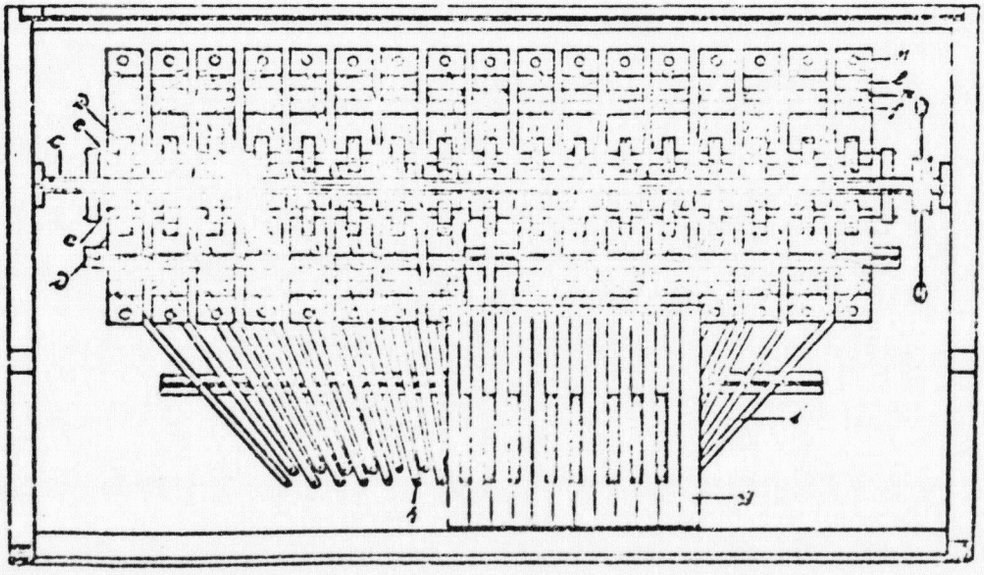


Abb. 1

Abb. 2



TRANSLATION - German Patent No. 567,657

A. Bienengraber - "MUSIC INSTRUMENT"

Patented in Germany August 26, 1931

The nature of the discovery is a musical instrument in which movably positioned tonebars, by means of keys, are brought into contact with resilient hammers located around an axle. In known musical instruments of this kind these contact hammers were attached to the rotating axle with springs, which had the drawback that the struck members were not properly struck. Aside from the fact that not all springs can work uniformly, with the result that the contact with the individual members had to be different, the size of the circular path of the impelled members was dependent on the speed of revolution, so that the contact of the striking members with the tone bars could not be achieved in the proper musical way. In this manner an improper contact was caused, which resulted in unclear tones.

These drawbacks will be resolved by the present discovery, wherein hammers or contact rollers by way of accurately measured holes are located on the supports on the resolving axle, so that they (under the influence of centrifugal force) must pass through a predetermined narrow circular path, out of which they [the hammers or rollers] will be diverted upon contact as far as the width of the hole will permit. Through this adaptation not only will the above-mentioned drawbacks be resolved, but also the advantage will be won in that, through the selection of a desired speed of

revolution of the axle, the dynamics of the sounds to desired artfull demands can be obtained. By the known prior art, however, a given speed of revolution could not be exceeded due to the springs and the weight of the contact members, for otherwise the tone bar would also be unintentially contacted and thus make sounds.

In the drawing there is a completed example of the invention, illustrating:

Fig. 1 a vertical view

Fig. 2 a top view of the mechanism of an instrument according to the inventor.

By way of the pedals "a" and "a_1" a flywheel "b" and the attached hammer axle "c" are set into motion. The round hammers "d" which move with the axle "c" lie with measured holes on the rods "e", are able to move radially, so that the hammers, depending on the speed of revolution, can move more or less outwardly through centrifugal force. The tone bars are "f", which, through the keys "g", are brought against the rotating hammers "d". Through contact of the key "g", th- arm of the lever "i" will be depressed by the movable section "h" which is attached to the key "g". The rising opposite end of lever "i" presses the rotating tone bar holder "l" around the pivot "k" and against the tone bar "f" which is separated by resilient material "m". The tone bar "f" is then pressed against the rotating hammers "d". After releasing the key "g", as a result of the counter-weight "n", the system shifts back into its original disengaged position. The hammers "d" spring back after contact with the tone bar, so that a clear tone

results. As long as the keys are depressed, a rapid sequence of tones results. The desired tone strength is regulated via the pedals, in that through slower or faster pedalling the axle revolves slower or faster, so that the hammers will strike the tone bars with more or less strength.

CLAIM

Musical instrument, by which movably positioned, bar-shaped ringing bodies are by means of keys, brought into contact with yielding hammers located around an axle, and that the hammers, by means of appropriately sized holes are positioned on the revolving holders "e" on the axle (c), so that, under the influence of centrifugal force they must pass through predetermined circular paths, out of which they will be deflected only by contact with tone bar f, and deflected only as far as the width of the hole permits.

ROYAUME DE BELGIQUE

SERVICE DE LA PROPRIÉTÉ INDUSTRIELLE

BREVET D'INVENTION

N° 515147

demande déposée le 20 octobre 1952 à 11 h. 45' ;

brevet octroyé le 14 octobre 1952.

E. BASSLER, résidant à BERLIN-STEGLITZ (Allemagne)

INSTRUMENT DE MUSIQUE A CLAVIER, DEPOURVU DE CORDES ET MUNI D'UN SYSTEME ELECTRIQUE DE PRODUCTION DE SONS

Le droit de priorité de la demande de brevet déposée en Allemagne les 31 octobre 1951 et 14 août 1952 - déclaration de l'intéressé -.

La présente invention est relative à un instrument de musique à clavier, dépourvu de cordes et muni d'un système électrique de production de sons.

L'instrument de musique suivant l'invention se caractérise par le fait qu'à chaque touche est associé un élément capable de vibrer mécaniquement et accordé en fonction du son à produire, cet élément étant animé en vibrations, lors de la manœuvre de la touche, dans un champ électrique ou électromagnétique servant à la production de sons. L'élément vibrant est constitué par un barreau ou une matière magnétiquement conductrice, de préférence par un fil d'acier. Au lieu d'un fil à section circulaire, on peut aussi employer, avec le même résultat, comme élément vibrant, un ruban ou forme d'anche. Le barreau est fermement serré à une extrémité et présente une longueur et une épaisseur correspondant à la hauteur du son particulier à engendrer. Ainsi, à chaque touche est associé un élément vibrant déterminé pour une hauteur de son donnée.

Suivant l'invention, l'extrémité, vibrant librement, du fil est maintenue en position fixe par un dispositif de retenue, dans la position de repos de la touche, et cette extrémité du fil est libérée, lors de la manœuvre de la touche, lorsque le fil a atteint une tension préalable nécessaire à la production de vibrations. Comme dispositif de retenue, on emploie avantageusement un aimant permanent approprié.

Pour éviter les bruits secondaires, causés par le dispositif de retenue et troublant la production des sons, lesquels bruits secondaires se manifestent, en particulier, lors de la libération ou de l'arrachement de l'élément vibrant, on prévoit un élément déflecteur ou écran entre le corps servant à engendrer les sons et le dispositif de retenue. Pour que les éléments vibrants puissent pénétrer à travers l'élément déflecteur ou écran, ce dernier est muni de découpures ou d'entailles à la manière d'un peigne. Pour obtenir

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une protection complète contre les bruits gênants venant de l'extérieur, il est avantageux de réaliser l'élément déflecteur ou écran sous forme d'une chambre fermée, dans laquelle sont enfermés les champs servant à la production du sons.

Pour obtenir une augmentation de l'effet d'écran, on peut aussi prévoir plusieurs éléments déflecteurs ou écrans placés l'un au-dessus de l'autre.

Dans une autre forme d'exécution de l'invention, les éléments déflecteurs ou écrans sont montés de manière à être mobiles dans la direction longitudinale des éléments vibrants. Grâce à cet agencement, on peut, en déplaçant les éléments déflecteurs de manière appropriée, modifier l'intensité du son produit.

En général les éléments vibrants sont attachés aux touches, tandis que le dispositif de retenue et l'élément déflecteur sont montés sur la caisse de l'instrument de musique. Inversement, on peut, toutefois, aussi attacher à chaque touche un dispositif de retenue et un élément déflecteur et amener à tirer l'élément vibrant à la caisse.

Suivant l'invention, on prévoit, devant le dispositif de retenue, un dispositif amortisseur ou étouffoir, qui cède au mouvement des éléments vibrants et amortit l'élément vibrant revenant à sa position de repos après la manœuvre de la touche afin d'empêcher des vibrations de retentissement lors du retour de l'élément vibrant vers le dispositif de retenue.

Etant donné que l'intensité des sons dépend de la proximité de l'élément vibrant avec le champ, on peut modifier la hauteur des sons par un déplacement approprié des touches après avoir frappé celles-ci. A cette fin, on prévoit, sous le point d'appui de chaque touche, une butée élastique, qui est réglée en vue de produire une intensité de son normale. Lorsque l'intensité de son requise est plus forte, la touche est poussée contre le support ou la butée élastique au-delà du point normal, en sorte que l'élément vibrant vient plus près du champ et qu'un son plus intense est produit.

Etant donné que, pour les sons graves et très graves, la longueur nécessaire de l'élément vibrant influencerait défavorablement les dimensions de l'instrument, l'élément vibrant destiné à la production de sons graves est attaché, suivant l'invention, à la touche, par l'entremise d'un ressort avantageusement en spirale.

Les dispositifs de retenue mécaniques pour les éléments vibrants peuvent être supprimés, si les éléments vibrants sont agencés de façon à être mis en vibrations, lorsqu'on agit sur les touches, par inertie.

Suivant une autre particularité de l'invention, à chaque touche est associé un boîtier fermé, servant d'élément déflecteur ou écran et muni d'une fente de passage pour l'élément vibrant. Dans le boîtier, le champ servant à engendrer les sons est agencé, vis-à-vis de l'élément vibrant, de façon que les vibrations de l'élément vibrant se produisent transversalement et, de préférence, perpendiculairement, à la direction du flux des lignes de force du champ. Cet agencement du champ vis-à-vis de l'élément vibrant présente l'avantage que la distance de l'élément vibrant, amené en vibrations, aux pôles reste toujours la même. L'élément déflecteur ou écran est réalisé, suivant l'invention, sous la forme d'une boîte circulaire, qui est montée de manière à pouvoir, avec l'aide de dispositifs de retenue appropriés, être déplacée en hauteur, en direction transversale et en direction longitudinale, vis-à-vis de l'élément vibrant. Grâce à ces possibilités de réglage prévues sur la boîte, un ajustement précis de l'élément vibrant vis-à-vis de la fente de passage est possible, par déplacement en direction transversale, tandis que l'intensité du son peut être modifiée à volonté par déplacement en direction longitudinale et en hauteur. Suivant l'invention, le champ servant à la production du son est monté excentriquement dans l'élément déflecteur et ce dernier élément est fixé sur le dispositif de retenue, de manière mobile en direction périphérique. Grâce à cette possibilité de faire tourner l'élément déflecteur autour de son axe, la distance entre l'élément vibrant et le flux de lignes de

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force peut être rectifié dans des limites étroites, à tel point que cet ensemble permet un réglage précis de l'intensité des sons.

Suivant l'invention, l'aimant de retenue pour l'élément vibrant est ajustable, dans le sens de la hauteur et de la longueur de l'élément vibrant, pour pouvoir atteindre la tension d'arrachement la plus favorable nécessaire. Pour éliminer dans la mesure du possible les bruits secondaires, la partie supérieure, tournée vers l'élément vibrant, de l'aimant de retenue est agencée de façon que l'élément vibrant prenne appui par un point ou par une ligne sur l'aimant de retenue.

Suivant l'invention, l'organe amortisseur associé à l'élément vibrant est fixé à la touche et prend élastiquement appui sur l'élément vibrant se trouvant en position de repos. Sur la caisse est monté un dispositif de retenue, qui maintient l'organe amortisseur, lorsque le point d'arrachement est atteint, en sorte que l'élément vibrant se soulève et peut vibrer devant le capteur de sons. Lorsque l'élément vibrant retourne dans sa position de repos, au moment où on lâche la touche, l'organe amortisseur s'applique avec une pression progressivement croissante contre l'élément vibrant.

Suivant l'invention, la touche elle-même est montée sur un couteau et est maintenue par une cheville placée à côté du support, cette cheville traversant la touche et s'étendant élastiquement à la partie supérieure de cette dernière. A sa tête, la cheville de retenue porte un ressort, qui rappelle la touche dans la position de repos et prend appui contre un support élastique. Pour pouvoir placer les touches juxtaposées à une hauteur commune, le couteau de support est monté de manière à être déplaçable en hauteur grâce à un système de vissage approprié. Au point d'appui de la touche, on prévoit dans la caisse une cheville de guidage, qui s'étend élastiquement à la partie inférieure de la touche. Grâce à ce montage et à ce guidage, conforme à l'invention, de la touche, un montage et un démontage aisés sont possibles, tandis que, par ailleurs, un changement de position des touches, grâce à la cheville de retenue avec le guidage supérieur et grâce à la cheville de retenue avec le guidage inférieur, est évité à coup sûr, en sorte qu'également un basculement latéral des diverses touches ne peut plus se produire.

Pour obtenir des effets supplémentaires d'amortissement, on prévoit, suivant l'invention, des organes amortisseurs à actionner indépendamment de la position des touches et, qui permettent d'amortir les éléments vibrants isolément ou en groupe, pendant le jeu. Ces organes amortisseurs peuvent se présenter sous forme de touches additionnelles, par la manoeuvre desquelles un étouffoir est appliqué contre l'élément vibrant et amortit ou étouffe ainsi les vibrations. Lorsque les éléments vibrants sont assujettis fixement à la caisse de l'instrument, l'organe amortisseur peut aussi consister en un électroaimant réglable, dont le circuit est fermé, lors de l'actionnement de la touche additionnelle d'amortissement.

Au lieu d'un élément vibrant en forme de barreau, tel qu'un fil ou une tige en acier, l'élément vibrant peut, suivant l'invention, être réalisé sous forme d'une fourche semblable à un diapason et amené en vibrations par un organe de percussion élastique actionné par la touche. L'élément vibrant en forme de fourche peut être assujetti soit à la touche, soit à la caisse. Dans le premier cas, l'organe de percussion retenu momentanément est assujetti à la partie inférieure de la touche, cet organe de percussion étant mis sous tension lors de l'abaissement de la touche, puis arraché de l'aimant et venant frapper l'élément vibrant. Dans le dernier cas, l'organe de percussion est également monté sur la touche, cet organe amenant l'élément vibrant en vibrations par un aimant de retenue ou par son inertie. Dans ce cas, la touche peut également porter un organe amortisseur, qui prend appui, en position de repos, sur l'élément vibrant.

Suivant l'invention, chaque touche forme avec les dispositifs et organes y associés servant à la production de sons une structure fermée et indépendante. Ainsi, on peut, sans difficulté, monter et faire des réparations aux instruments de musique. Lorsque, par exemple, une touche déterminée de l'

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instrument de musique ne travaille plus correctement, il suffit d'enlever cette touche et de la remplacer par une autre réglée à la bonne hauteur de son, de telle sorte que l'instrument est de nouveau prêt à l'emploi.

L'assemblage de chaque touche en un ensemble forme est possible, étant donné que les différents organes et dispositifs appartenant à une touche ne dépassent pas la largeur des touches, de sorte qu'il est possible de ranger côte à côte plusieurs touches de même forme de construction.

Le mode de fonctionnement de l'instrument de musique suivant l'invention est le suivant :

A chaque touche du clavier, réalisé comme un clavier de piano, est assujetti un élément vibrant accordé pour donner le son correspondant à la touche. Dans la position de repos de la touche, l'extrémité, vibrant librement, de l'élément vibrant prend appui sur un aimant. Lorsqu'on abaisse la touche, l'élément vibrant s'infléchit à la manière d'un ressort, en fonction de la force de l'aimant, puis lorsqu'une tension préalable déterminée est atteinte, est arraché de l'aimant et se met à vibrer dans le ton qui lui est propre. Par le mouvement de la touche, l'élément vibrant est amené à la hauteur du champ servant à la production de sons. Le capteur de sons qui comporte, de manière connue en soi, des pièces polaires, transforme les vibrations de l'élément vibrant en tensions électriques, qui sont transmises par un amplificateur à un haut-parleur. Lorsqu'une butée élastique est prévue sous les touches, on peut, après l'abaissement des touches, c'est-à-dire après la production proprement dite du son, obtenir des modifications d'intensité de son ou des effets de battement supplémentaires en appuyant plus ou moins fort sur la butée élastique, de sorte que l'extrémité, vibrant librement, de l'élément vibrant est amenée plus ou moins près du capteur de sons. Les bruits gênants, qui prennent naissance, ainsi que le montre l'expérience, lors de l'arrachement et du retour de l'élément vibrant sur l'aimant de retenue, peuvent être évités par l'élément déflecteur ou écran, constitué par un corps fermé et présentant une fente, pour permettre le passage de l'élément vibrant. Grâce à l'élément déflecteur, les lignes de force émises par le capteur de sons sont court-circuitées à l'extérieur de l'élément déflecteur, en raison de la conductibilité, en sorte que l'élément déflecteur forme une cloison magnétique, à l'extérieur de laquelle (en se plaçant dans le capteur de sons) il n'y a pas de lignes de force. L'élément déflecteur doit, dès lors, se trouver entre l'aimant de retenue et le capteur de sons.

Au lieu du dispositif de retenue magnétique, on peut aussi employer un ressort de retenue mécanique.

La production de sons peut aussi se faire, avec le même agencement, d'après le principe inductif ou capacitif, auquel cas notamment l'élément vibrant est monté, comme électrode, en regard des bobines où est agencé comme élément à capacité variable.

Les dessins ci-annexés représentent, à titre d'exemple, une forme d'exécution de l'invention. Dans ces dessins :

- la figure 1 représente schématiquement une touche avec un élément vibrant et un capteur ou générateur de sons;

- la figure 2 montre en détails l'élément déflecteur ou écran selon une forme d'exécution modifiée;

- la figure 3 montre l'élément vibrant avec un dispositif de retenue mécanique;

- la figure 4 est une vue correspondant à la figure 1, avec une disposition renversée de l'élément vibrant et du capteur ou générateur de sons;

- la figure 5 montre en détails l'élément déflecteur ou écran;

- la figure 6 montre un élément vibrant pour sons graves;

- la figure 7 montre un élément vibrant avec dispositif amortisseur ou étouffoir;

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- la figure 8 représente une autre forme d'exécution du capteur ou générateur de sons avec une touche montrée de manière schématique;

- la figure 9 est une vue correspondant à la figure 8 dans la direction A;

- la figure 10 est une vue latérale correspondant à la figure 8;

- la figure 11 représente l'aimant de retenue avec une touche montrée de manière schématique;

- la figure 12 est une vue en plan correspondant à la figure 11;

- la figure 13 montre différentes formes de l'aimant de retenue;

- la figure 14 montre un organe amortisseur ou étouffoir, monté sur la touche;

- la figure 15 est une vue analogue à la figure 14;

- la figure 16 représente la partie du montage entourant une touche;

- la figure 17 montre un organe amortisseur ou étouffoir supplémentaire avec élément vibrant fixé à la caisse;

- la figure 18 montre une forme d'exécution modifiée selon la figure 17;

- la figure 19 représente un organe amortisseur supplémentaire avec un élément vibrant monté sur la touche;

- la figure 20 montre un élément vibrant, en forme de fourche, monté sur une touche, et

- la figure 21 est une vue correspondant à celle de la figure 20, mais dans le cas où l'élément vibrant est assujetti à la caisse.

A une touche 1 suspendue au point de pivotement 2 et supportée par la caisse 3, par l'entremise d'un ressort 4, est assujetti un dispositif de retenue 6, dans lequel est attaché l'élément vibrant 7 en forme de barreau. Dans la position de repos, c'est-à-dire lorsque la touche 1 est en position horizontale, l'extrémité de l'élément vibrant 7 repose sur l'aimant de retenue 8. Lorsque la touche 1 est enclenchée contre la butée élastique 5, l'élément vibrant 7 s'infléchit, jusqu'à être arraché de l'aimant 8 et à vibrer, à travers la fente 10 de l'élément déflecteur ou écran 9, devant les pièces polaires 11 du capteur de sons 12.

Comme montré à la figure 2, le capteur de sons est réalisé sous forme d'une boîte fermée, comportant une partie 13 munie d'un couvercle 14.- Dans la partie 13 sont ménagées des fentes 10 pour livrer passage à l'élément vibrant.

A la figure 3, l'élément vibrant est muni d'un ressort d'arrachement 15, au lieu d'être associé à un aimant de retenue.

A la figure 4, l'élément vibrant est monté sur la caisse 3, tandis que la touche porte l'aimant de retenue et l'élément déflecteur ou écran. Lorsqu'on abaisse la touche, l'élément vibrant 7 est infléchi vers le haut par l'aimant de retenue 16, qui est assujetti par un dispositif de maintien 17 à la touche 1. Simultanément, le peigne déflecteur 18, également fixé à la touche 1 par un dispositif de maintien 19, est déplacé vers le haut. Après avoir été arraché de l'aimant de retenue 16, l'élément vibrant 7 vibre devant le capteur de sons 11, 12, le peigne déflecteur 18 se trouvent alors au-dessus de l'élément vibrant.

L'élément déflecteur 9, 18 est muni d'entailles 10, permettant le passage de l'élément vibrant. A la figure 6, on a représenté un élément vibrant pour sons graves. A la touche 1, est assujetti l'élément vibrant en forme de ressort en spirale 21, muni d'une partie vibrante 20, qui est excitée de la manière habituelle.

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. La figure 7 montre un agencement avec dispositif amortisseur. Dans l'élément vibrant 7 est monté le dispositif amortisseur ou étouffoir 20 relié, par le ressort 22, à la caisse 3, ce dispositif amortisseur prenant appui sur l'élément vibrant 7 dans la position de repos de ce dernier et libérant ce dernier après arrachement de l'aimant de retenue.

. A la figure 8, l'élément vibrant 7 est assujetti à une touche 1, l'extrémité libre du dit élément vibrant prenant appui sur l'aimant de retenue 8. Au-dessus de l'élément vibrant 7 est monté l'élément déflecteur électro-magnétique 24, en forme de boîte, dans lequel le champ électro-magnétique 25 est monté excentriquement. L'élément déflecteur ou écran 24 est assujetti à un bras en arc de cercle 27, qui présente une fente 28. L'élément déflecteur 24 peut être tourné à volonté dans cette fente 28. Le bras de support 27 est fixé à la cornière de maintien 29. Celle-ci présente une fente longitudinale 30, qui permet un réglage en hauteur du bras de support 27 vis-à-vis de l'élément vibrant 7. L'autre aile de la cornière 29 prend appui sur la caisse 33, qui présente une fente longitudinale 34, dans laquelle la cornière et, avec elle, l'élément déflecteur peuvent être déplacés dans le sens de la longueur de l'élément vibrant 7. L'aile, appliquée contre la caisse 33, de la cornière de retenue 29 présente, comme il ressort de la figure 9, une fente transversale 32, qui permet un ajustement de l'élément déflecteur 24, de façon que l'élément vibrant 7 puisse passer sans entrave à travers la fente 28. La cornière 29 est reliée par un boulon 31 à la caisse 33.

L'aimant de retenue 8 de l'élément vibrant 7 est également ajustable en hauteur et monté de manière à pouvoir être déplacé dans le sens de la longueur de l'élément vibrant. A cette fin, l'aimant de retenue 8 est monté de manière à pouvoir être déplacé en hauteur dans une douille 35, qui est fixée, par un boulon 37, à la caisse 33, dans une fente 36. Pour que l'élément vibrant puisse prendre appui sur l'aimant par un point ou par une ligne, la partie supérieure de l'aimant de retenue 8 est réalisée de manière à fournir un appui punctiforme ou linéaire. A la figure 13, on a représenté plusieurs aimants de retenue 38, 39, 40, 41 et 42 avec appui punctiforme ou linéaire.

Comme il ressort des figures 14 et 15, on prévoit, sur la touche 1, à côté de l'élément vibrant 7, un organe amortisseur, consistant en un ressort élastique 43. Le ressort 43 porte, à son extrémité intérieure, l'amortisseur proprement dit 44 en matériau élastique, qui, dans la position de repos de la touche 1, représentée sur les dessins, prend appui contre le côté inférieur de l'élément vibrant. Lorsque la touche 1 est abaissée, l'élément vibrant 7, maintenu fixement par l'aimant de retenue 8, s'infléchit. Dans ce cas, l'amortisseur 44 suit l'élément vibrant 7, jusqu'à ce qu'il soit maintenu par le dispositif de retenue 45 monté sur la caisse 33. Lorsqu'on continue à abaisser la touche 1, l'élément vibrant 7 est arraché de l'aimant de retenue 8 et vient vibrer dans le champ magnétique 25 (figure 8). Lorsqu'on lâche la touche, de manière à lui permettre de revenir dans sa position de repos, l'amortisseur 44 retenu par le dispositif de retenue 45 s'applique, avec une force élastique lentement croissante, sur l'élément vibrant et amortit ainsi les vibrations, sans que naissent des bruits gênants. Comme le montre la figure 16, le dispositif de retenue 45 est remplacé par une corde 46, qui est fixée par une extrémité au dispositif amortisseur 44 et, par son autre extrémité, à la caisse 33.

La figure 16 représente un élément formé, dans lequel la touche 1 avec l'élément vibrant 7, l'aimant de retenue 8, l'élément déflecteur ou écran 24, avec le champ 25 sont montés sur une partie commune de la caisse 33. La touche 1 est montée sur des supports effilés 47, 48. La cheville de support 47 est réglable en hauteur grâce à un système de vissage 49, en sorte que par cette mesure simple les divers éléments juxtaposés qui entourent une touche peuvent être amenés à la même hauteur. Près des chevilles 47, 48 est montée une cheville de retenue 50, qui traverse un trou 54 ménagé dans la touche et est maintenue dans le guidage élastique à la partie supérieure de la touche. A la tête, la cheville de retenue 50 est munie d'une vis 51, qui porte un ressort 52, qui applique la touche 1, dans sa position de repos, contre une

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butée élastique 53. A l'endroit [illegible] sur la touche [illegible], une cheville 56 est assujettie à la caisse 33, cette cheville 56 étant engagée dans un trou 57 ménagé dans la touche 1 et étant guidée, au côté inférieur, par la plaquette élastique 58. Grâce au guidage supérieur et inférieur de la touche, tout déplacement et tout basculement latéral de la touche sont rendus impossibles. Sur la caisse 33 est fixée la butée élastique 59 pour la touche.

La figure 17 montre une touche et un élément vibrant assujetti à la caisse 33, l'élément vibrant étant amené en vibrations par un organe de percussion 60 monté sur la touche. Sous la touche 1 se trouve une touche spéciale d'amortissement 61, qui peut être actionnée indépendamment de la position de la touche 1. La touche d'amortissement 61 porte, à son extrémité, un contact 62, qui ferme le circuit 63 prévu avec le dispositif de réglage 64 et excite ainsi l'électroaimant 65, 66, qui est monté sous l'élément 7 et amortit les vibrations, lors de l'abaissement de la touche 61.

A la figure 18, la touche 67 sert de touche d'amortissement, cette touche 67 portant, à son extrémité, un amortisseur 68, qui lors de l'abaissement de la touche 67, prend appui sur l'élément vibrant 7, à l'encontre de la force du ressort 69, et amortit les vibrations.

La figure 19 montre une touche 1 avec un élément vibrant 7 et un aimant de retenue 8. Sous la touche 1 est montée la touche d'amortissement 67 avec l'amortisseur 68 et le ressort 69, qui est actionnée de la même manière qu'à la figure 18.

A la figure 20, la touche 1 porte un élément vibrant 70 en forme de fourche, qui est excité, lors de la manoeuvre de la touche, par l'organe de percussion 71, influencé par l'aimant de retenue 72. A la figure 21, l'élément vibrant 72, en forme de fourche, est assujetti à la caisse, tandis que la touche porte l'organe de percussion 73 et l'organe amortisseur 74.

REVENDICATIONS.

1. Instrument de musique à clavier, dépourvu de cordes et muni d'un système électrique de production de sons, caractérisé en ce qu'à chaque touche est associé un élément capable de vibrer mécaniquement et accordé en fonction du son à produire, cet élément étant amené en vibrations, lors de la manoeuvre de la touche, dans un champ électrique ou électromagnétique servant à la production de sons.

2. Instrument de musique suivant la revendication 1, caractérisé en ce que l'élément vibrant est constitué par un barreau en une matière magnétiquement conductrice, de préférence par un fil d'acier, lequel barreau est fermement serré à une extrémité et présente une longueur et une épaisseur correspondant à la hauteur du son particulier à engendrer.

3. Instrument de musique suivant les revendications 1 et 2, caractérisé en ce que l'extrémité, vibrant librement, du fil est maintenu en position fixe par un dispositif de retenue, dans la position de repos de la touche, et cette extrémité du fil est libérée, lors de la manoeuvre de la touche, lorsque le fil a atteint une tension préalable nécessaire à la production de vibrations.

4. Instrument de musique suivant les revendications 1 à 3, caractérisé en ce qu'on emploie, comme dispositif de retenue, un aimant de force suffisante.

5. Instrument de musique suivant la revendication 4, caractérisé en ce que l'aimant de retenue pour l'élément vibrant est ajustable dans le sens de la hauteur et de la longueur de l'élément vibrant et est agencé, dans sa partie supérieure, tournée vers l'élément vibrant, de façon que l'élément vibrant prenne appui par un point ou par une ligne sur l'aimant de retenue.

6. Instrument de musique suivant les revendications 1 à 5, caractérisé en ce qu'un élément déflecteur ou écran est prévu entre le champ servant à engendrer les sons et le dispositif de retenue, cet élément déflecteur éliminant les bruits secondaires, causés par le dispositif de retenue et troublant

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la production des sons.

7. Instrument de musique suivant la revendication 6, caractérisé en ce que l'élément déflecteur ou écran est muni de découpures ou d'entailles à la manière d'un peigne, pour que les éléments vibrants puissent le traverser.

8. Instrument de musique suivant les revendications 6 et 7, caractérisé en ce que l'élément déflecteur ou écran est réalisé sous forme d'une chambre fermée, dans laquelle sont enfermés les champs servant à la production de sons.

9. Instrument de musique suivant les revendications 6 à 8, caractérisé en ce que pour obtenir une augmentation de l'effet déflecteur, plusieurs éléments déflecteurs ou écrans sont prévus l'un au-dessus de l'autre.

10. Instrument de musique suivant les revendications 1 à 9, caractérisé en ce qu'à chaque touche est associé un boîtier fermé, servant d'élément déflecteur ou écran et muni d'une fente de passage pour l'élément vibrant, dans lequel boîtier le champ servant à engendrer les sons est agencé vis-à-vis de l'élément vibrant de façon que les vibrations de l'élément vibrant se propagent transversalement et, de préférence, perpendiculairement à la direction du flux des lignes de force.

11. Instrument de musique suivant la revendication 10, caractérisé en ce que le boîtier servant d'élément déflecteur ou écran est réalisé sous la forme d'une boîte circulaire, qui est montée de manière à pouvoir, avec l'aide de dispositifs de retenue appropriés, être déplacée en hauteur, en direction transversale et en direction longitudinale, vis-à-vis de l'élément vibrant.

12. Instrument de musique suivant les revendications 10 et 11, caractérisé en ce que le champ servant à la production de sons est monté excentriquement dans l'élément déflecteur et ce dernier élément est fixé sur le dispositif de retenue, de manière amovible en direction périphérique.

13. Instrument de musique suivant les revendications 1 à 12, caractérisé en ce que les éléments vibrants sont assujettis aux touches, tandis que le dispositif de retenue et l'élément déflecteur ou écran sont assujettis à la caisse de l'instrument.

14. Instrument de musique suivant les revendications 1 à 12, caractérisé en ce qu'à chaque touche sont assujettis un dispositif de retenue et un dispositif déflecteur, tandis que l'élément vibrant est assujetti à la caisse.

15. Instrument de musique suivant les revendications 1 à 14, caractérisé en ce qu'on prévoit, devant le dispositif de retenue, un dispositif amortisseur en étoffoir, qui cède au mouvement des éléments vibrants et qui amortit les vibrations de ces derniers.

16. Instrument de musique suivant les revendications 1 à 14, caractérisé en ce qu'un organe amortisseur élastique prenant appui sur l'élément vibrant se trouvant en position de repos est monté sur la touche, cet organe amortisseur étant, lorsque la position d'arrachage de l'élément vibrant est atteinte, soulevé de ce dernier élément par un dispositif de retenue monté sur la caisse, de façon à s'appliquer avec une pression croissante sur l'élément vibrant, lorsque ce dernier revient dans la position de repos.

17. Instrument de musique suivant les revendications 1 à 16, caractérisé en ce que la touche est montée sur un couteau et est maintenue par une cheville placée à côté du support, cette cheville traversant la touche et s'étendant élastiquement à la partie supérieure de cette dernière, la cheville de retenue portant, à sa tête, un ressort ramenant la touche dans sa position de repos.

18. Instrument de musique suivant la revendication 17, caractérisé en ce que le couteau de support est agencé de manière à être déplaçable

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19. Instrument de [illegible] suivant les revendications 17 et 18, caractérisé en ce qu'au point d'[illegible] la touche, on prévoit dans la caisse une cheville de guidage, qui s'étend élastiquement à la partie inférieure de la touche.

20. Instrument de musique suivant les revendications 1 à 19, caractérisé en ce qu'on prévoit des organes amortisseurs à manoeuvrer mécaniquement, indépendamment de la position des touches, par exemple par pression, ces organes permettant d'amortir les éléments vibrants isolément ou en groupe, pendant le jeu.

21. Instrument de musique suivant la revendication 20, caractérisé en ce que, lorsque les éléments vibrants sont montés sur la caisse, un organe amortisseur électromagnétique réglable est prévu, le circuit de cet organe étant fermé lors de la manoeuvre de la touche d'amortissement.

22. Instrument de musique suivant la revendication 1, caractérisé en ce que l'élément vibrant est réalisé sous forme d'une fourche semblable à un diapason et amené en vibrations par un organe de percussion élastique actionné par la touche.

23. Instrument de musique suivant la revendication 22, caractérisé en ce que l'élément vibrant en forme de fourche est assujetti soit à la touche, soit à la caisse.

24. Instrument de musique suivant les revendications 1 à 23, caractérisé en ce que, en vue de modifier l'intensité du son, on prévoit une butée élastique pour les touches.

25. Instrument de musique suivant les revendications 1 à 24, caractérisé en ce que, en particulier pour produire des sons plus graves, l'élément vibrant est assujetti à la touche, par l'entremise d'un ressort de préférence en spirale.

26. Instrument de musique suivant les revendications 1 à 25, caractérisé en ce que les éléments vibrants sont agencés de façon à être amenés en vibrations par inertie, lors de la manoeuvre des touches.

27. Instrument de musique suivant les revendications 1 à 26, caractérisé en ce que chaque touche forme avec les dispositifs et organes y associés servant à la production de sons, une structure fermée et indépendante.

P.PCH. K. BASSLER.

Mandataire : A. VAUTIER HAECHEN.

2 planches 3 dessins.

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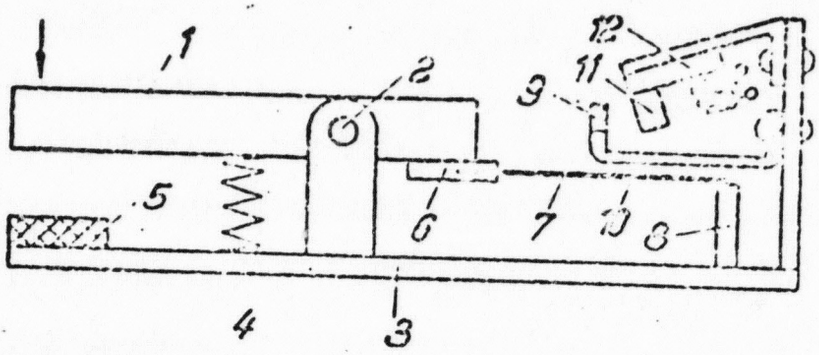


Fig. 1

Fig. 2

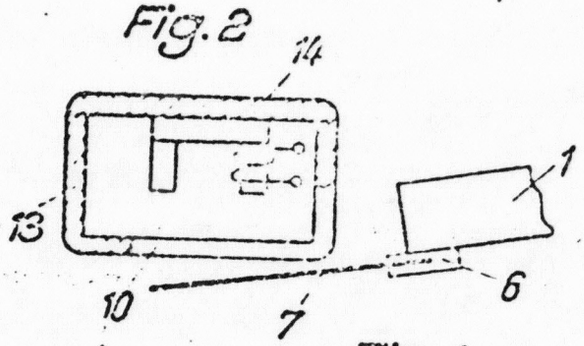


Fig. 3

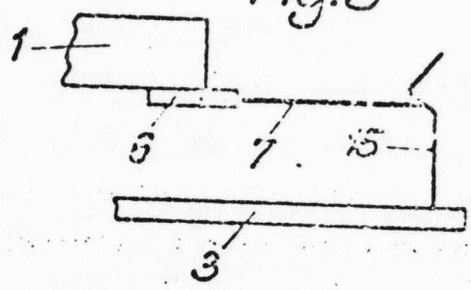


Fig. 4

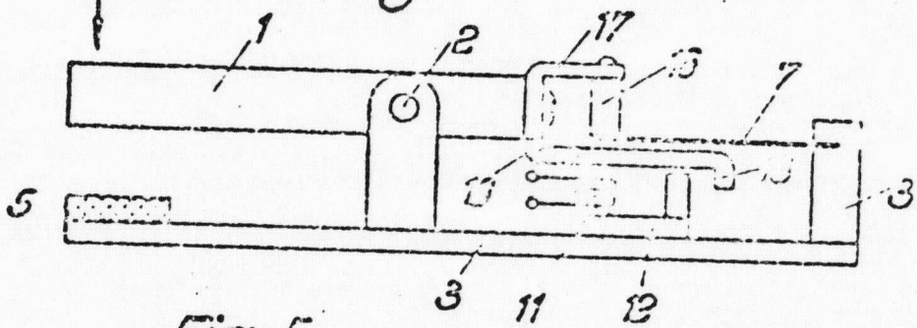


Fig. 5

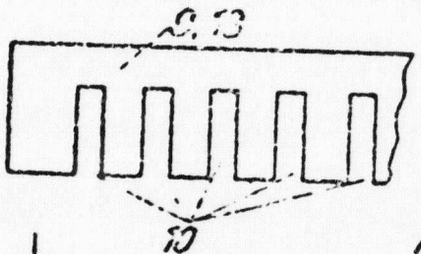


Fig. 6

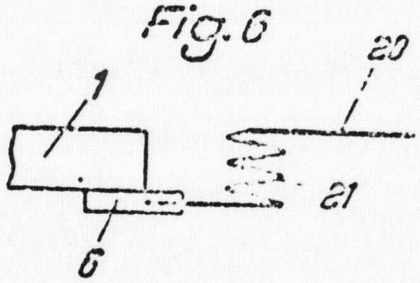


Fig. 7

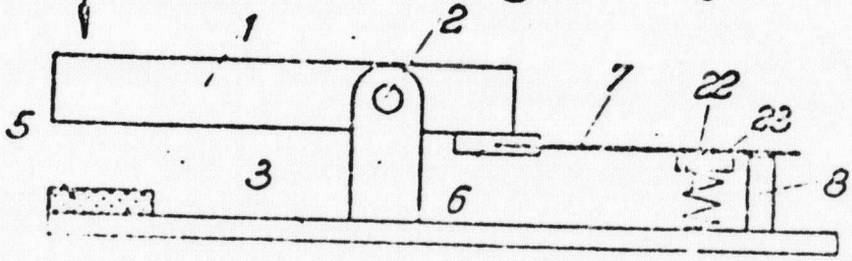


Fig. 8

Fig. 9

Fig. 10

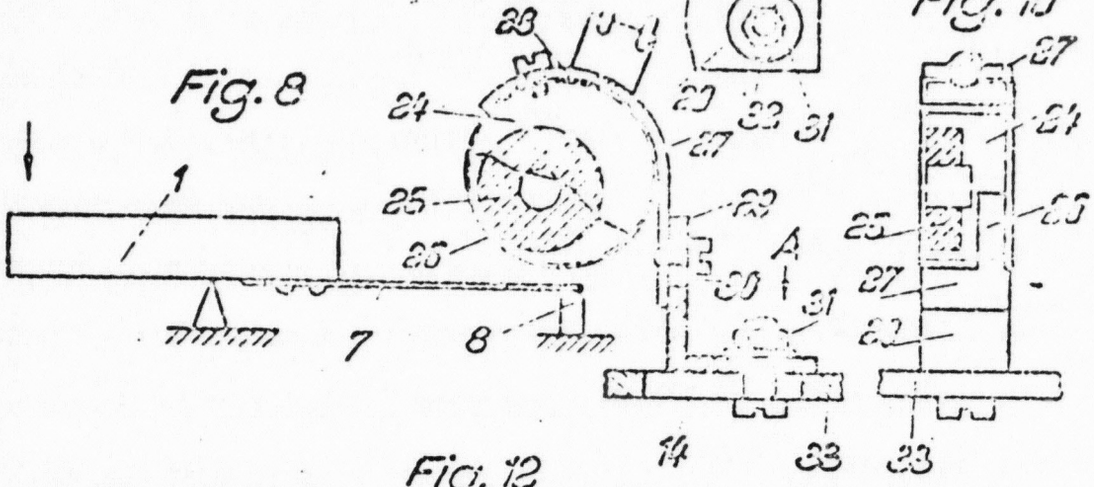


Fig. 11

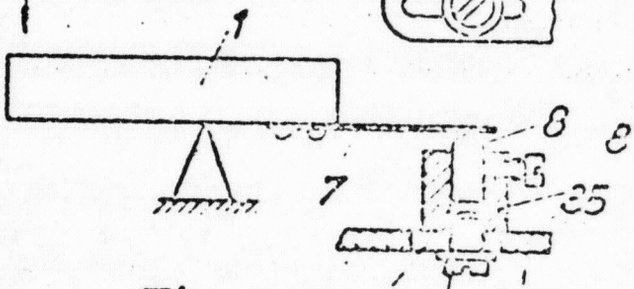


Fig. 12

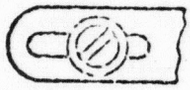
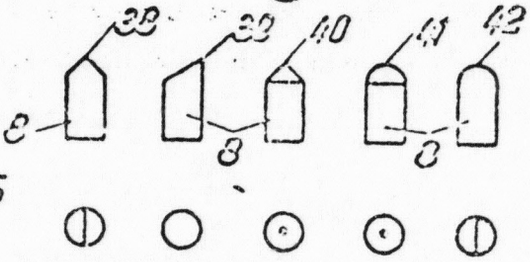


Fig. 13



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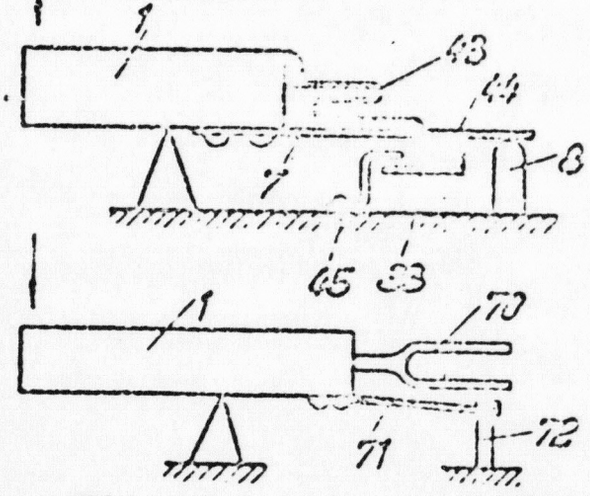


Fig. 15

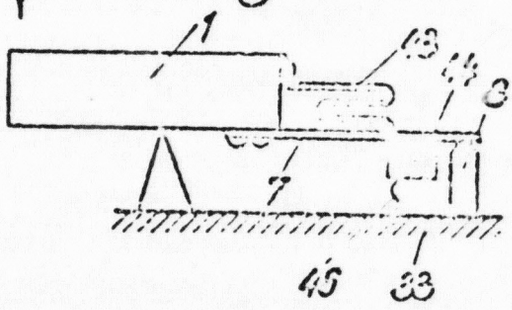


Fig. 20

Fig. 21

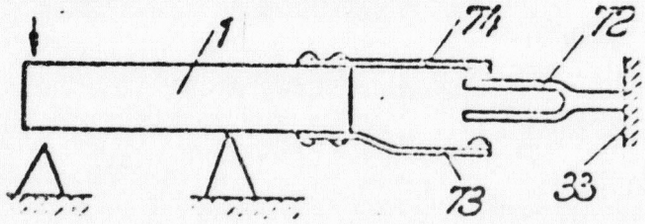


Fig. 16

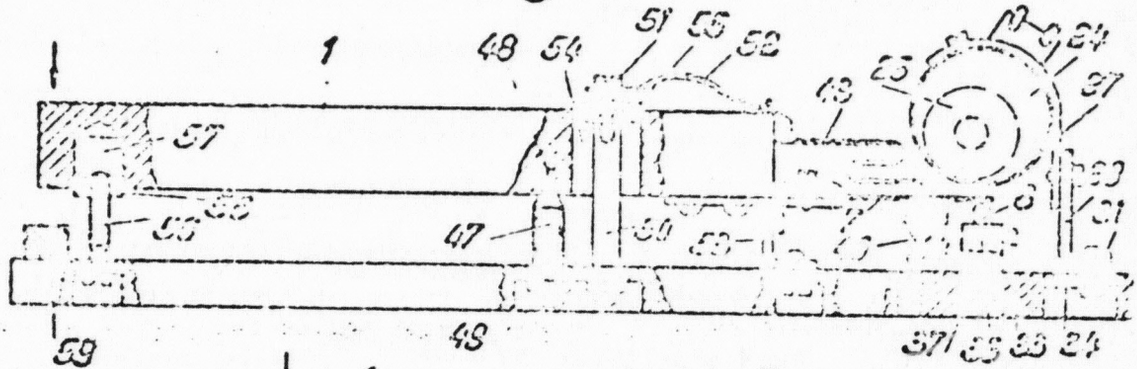


Fig. 17

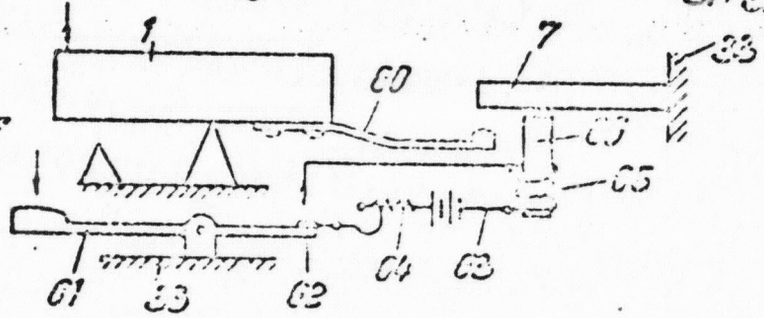


Fig. 18

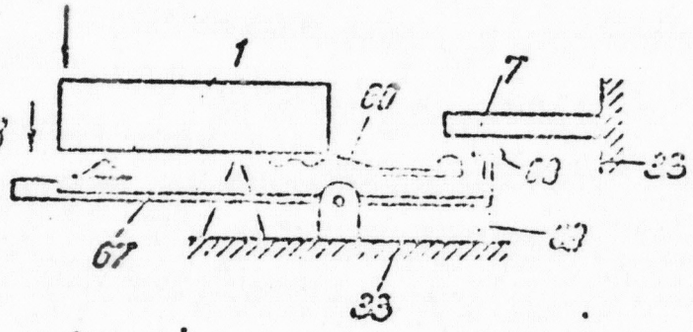
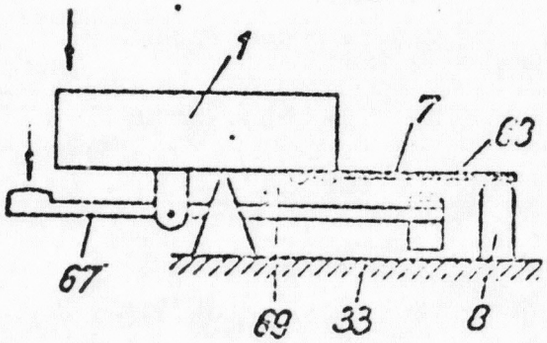


Fig. 19



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KINGDOM OF BELGIUM

INDUSTRIAL PROPERTY SERVICE

PATENT OF INVENTION

No. 515147

Application filed October 28, 1952 at 11:25 A.M.:
Patent granted November 14, 1952.

K. BASSLER, residing at BERLIN-STEGLITZ (Germany)

STRINGLESS MUSICAL INSTRUMENT WITH KEYBOARD, EQUIPPED WITH ELECTRICAL SOUND PRODUCING SYSTEM.

(having been the object of patent disclosures filed in Germany October 31, 1951 and August 14, 1952 - declaration by the applicant-).

The present invention relates to a stringless musical instrument with keyboard, equipped with an electrical sound producing system.

The musical instrument according to the invention is characterized by the fact that each key is associated with an element able to mechanically vibrate and to be tuned as a function of the sound to be produced. This element is caused by a touch of the key, to vibrate within an electric or electromagnetic field which serves to produce the sounds. The vibrating element is composed of a bar made of a magnetically conductive material, preferably a steel wire. Instead of a wire with circular cross-section, one can also use a reed-shaped bar as the vibrating element with the same result. The bar is firmly held at one extremity and has a length and thickness corresponding to the tone of the particular sound to be produced. In this way, each key is associated with a vibrating element specific to a given pitch of sound.

According to the invention, the freely vibrating extremity of the wire is maintained in a fixed position by a retaining device when the key is in the rest position. Upon manipulating the key, this extremity is released once the wire has reached a predetermined tension needed for producing vibrations. As a retaining device one can make excellent use of an appropriate permanent magnet.

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Secondary noises caused by the retaining device and upsetting sound production which occur, in particular, upon release or pulling away of the vibrating element, are avoided by providing a deflector element or a screen between the field serving to produce the sound and the retaining device. In order for the vibrating elements to pass through the deflector element or screen, the latter incorporates slits or openings similar to those of a comb. To obtain full protection against annoying noises coming from the outside, it is useful to make the deflecting element or screen in the form of a closed chamber within which the fields serving to produce sounds are contained.

In order to increase the effect of screening one can also provide several deflector elements or screens placed one above the other.

In another version of the invention the deflector elements or screens are assembled such as to be mobile along the longitudinal direction of the vibrating elements. As a result of the arrangement one can modify the intensity of the sound produced by displacing the deflector elements in the appropriate fashion.

In general, the vibrating elements are attached to the keys whereas the retaining device and the deflector element are mounted onto the case of the musical instrument. Inversely, one can just as well attach a retaining device and a deflector element to each key and fix the vibrating element to the case.

According to the invention, in front of the retaining device, a damping or silencing device is provided which yields to the movement of the vibrating elements and damps the vibrating element as the latter returns to its rest position after touching the key. This prevents vibrations due to bounce of the vibrating element as it returns to the retaining device.

Given that the intensity of the sounds depend upon the proximity of the vibrating element to the field, one can modify the strength of the sounds by an appropriate displacement of the keys after striking the latter. For this purpose an elastic stop is provided at the base of each key. The former is adjusted in order to produce a normal sound intensity. When the intensity of sound required is greater, the key is pushed against the support or the elastic stop beyond the normal point such that the vibrating element comes closer to the field and a more intense sound is produced.

Since for low and very low notes, the required length of the vibrating element would have an unfavorable effect upon the dimension of the instrument, the invention provides for attaching the vibrating element used for the production of low notes to the key by means of a spiral spring.

According to another version of the invention each key is associated with a closed box which serves as a deflector element or screen and which has a slot through which the vibrating element can pass. In this box the field serving to produce the sounds is arranged with respect to the vibrating element such that the vibrations of the latter are produced transversally and, preferably, perpendicularly to the direction of the flux of the lines of force of the field. This arrangement of the field with respect to the vibrating element has the advantage that the distance between the vibrating element, brought into vibration, and the poles remains constant. According to the invention the deflecting element or screen is made in the shape of a circular box mounted so as to be able to be able to be displaced in height, transversally or longitudinally with respect to the vibrating element by means of appropriate retaining devices. As a result of these possibilities for regulation provided on the box, a precise adjustment of the vibrating element with respect to the slot opening is possible by a displacement in the transverse direction. Similarly, the intensity of the sound can be modified at will by a displacement in the longitudinal direction and in height. According to the invention, the field serving to produce the sounds is arranged eccentrically inside the deflector element. The latter element is attached to the retaining device such as to be movable in a peripheral direction. As a result of this possibility of being able to turn the deflector element about its axis, the distance between the vibrating element and the flux of lines of force can be modified within narrow limits such that this arrangement permits a precise regulation of the sound intensity.

According to the invention the retaining magnet for the vibrating element is adjustable along the height and length of the vibrating element in order to attain the most favorable required break-away tension. In order to eliminate secondary noises as much as possible, the top portion of the retaining magnet, turned toward the vibrating element, is arranged such that a point or line of the latter is brought against the retaining magnet.

According to the invention, the damping device associated with the vibrating element is attached to the key and elastically lands on the vibrating element when the latter is in its rest position. On the case a retaining device is mounted which maintains the damping device such that the vibrating element is raised and can vibrate in front of the sound pick up once the break-away point is reached. When the vibrating element returns to its rest position upon releasing the key, the dampening device presses against the vibrating element in progressively increasing degree.

According to the invention, the key itself is mounted onto a knife and is maintained by means of a pin placed to the side of the support. The pin goes through the key and extends elastically to the upper portion of the latter. At the top of the retaining pin is a spring which returns the key to its rest position and presses against an elastic support. In order to bring adjacent keys to a uniform height, the knife support is arranged so as to be movable in height by means of an appropriate bolting system. At the contact point of the key a guide pin is

provided inside the case which extends elastically to the lower portion of the key. As a result of this key assembly and guide the invention makes easy assembly and disassembly possible, while the retaining pin with upper guide and the retaining pin with lower guide completely prevent a change in position of the keys as well as their lateral movement.

In order to obtain additional damping effects the invention provides for damping devices which are activated independently of the position of the keys and which allow damping the vibrating elements either individually or in groups as the instrument is played. These damping devices can be in the form of additional keys, the striking of which causes a damper is brought against the vibrating element and thereby damps or silences the vibrations. When the vibrating elements are fixed solidly to the instrument case, the damping device can also consist of a regulatable electromagnet the circuit of which is closed by activation of the additional damping key.

In place of a bar-shaped vibrating element, such as a steel wire or reed, the vibrating element can, according to the invention, be made in the form of a fork similar to a tuning fork and brought into vibration by an elastic percussion device which is activated by the key. The fork-shaped vibration element can be fixed either to the key or to the case. In the former cases the magnetically retained percussion device is fixed to the lower part of the key and is placed under tension as the key is depressed then pulled away from the magnet so as to strike the vibrating element. In the latter case, the percussion device is again mounted onto the key. The percussion device puts the vibrating element into vibration by means of a retaining magnet or by its inertia. In this case, the key can also carry a damping device which pressed upon the vibrating element when in the rest position.

According to the invention, each key, along with its associated sound-producing devices and components, forms a closed and independent structure. One can therefore assemble and repair musical instruments without difficulty. For example, when a particular key of the instrument does not work correctly all that is required for the instrument to be made ready for playing is to remove that key and to replace it with another which has been adjusted for the same pitch.

The build up of each key into a self-contained assembly is possible since the various components and devices belonging to a key do not exceed the width of the keys. In this way it is possible to arrange several keys of the same construction side by side.

According to the invention the operating mode of the musical instrument is as follows:

To each key of the keyboard, the latter similar to that of a piano, a vibrating element is attached which is tuned so as to produce the sound

corresponding to the key. In the rest position of the key, the freely vibrating extremity of the vibrating element presses against a magnet. When one lowers the key, the vibrating element bends in a whip-like fashion which is a function of the strength of the magnet. Once a previously determined tension is reached, the vibrating element is pulled away from the magnet and begins to vibrate at its own pitch. The movement of the key brings the vibrating element to the level of sound producing field. The sound pick up consists, as is well known, of polar pieces which allow the vibrations of the vibrating element to be transformed into electrical voltages which are transmitted through an amplifier to a loud speaker. When an elastic stop is provided below the keys one can, after the lowering of the keys (that is, after the actual production of sound), obtain sound intensity variations or supplementary beating effects by pushing with more or less force against the elastic stop. This occurs by allowing the freely vibrating extremity of the vibrating element to be brought into greater or lesser proximity with the sound pick up. The disturbing sounds, which experience indicates to be created as the vibrating element breaks away and returns to the retaining magnet, can be avoided by the deflector element or screen. The latter is a closed body having a slit through which the vibrating element can pass. As a result of the deflector element, the lines of force emanating from the sound pick up are short-circuited at the exterior of the deflector element due to its conductivity. In this manner, the deflector element forms a magnetic enclosure outside of which (as seen from inside the sound pickup) there are no lines of force. The deflector element must then be placed between the retaining magnet and the sound pick up.

In place of the magnetic retaining device one can also use a mechanical retaining spring.

Sound production can also be done with the same arrangement by means of an inductive or capacitive principal. In this case, the vibrating element is mounted in front of some coils or as an electrode in a variable capacitor arrangement.

The attached drawings provide an example of one means of executing the invention.

In these drawings:

-figure 1 shows schematically a key with a vibrating element and a sound pickup or generator;

-figure 2 shows in detail the deflector element or screen according to a modified version;

-figure 3 shows the vibrating element with a mechanical retaining device;

-figure 4 is a view which corresponds to figure 1 and which shows an inverted arrangement of the vibrating element and the sound pick up or generator;

-figure 5 shows in detail the deflector element or screen;

-figure 6 shows a vibrating element for low notes;

-figure 7 shows a vibrating element with a damping or silencing device;

-figure 8 depicts in schematic fashion another form of construction of the sound pick up or generator with key;

-figure 9 is a view which corresponds to figure 8 along the A direction;

-figure 10 is a side view corresponding to figure 8;

-figure 11 depicts in schematic fashion the retaining magner with a key;

-figure 12 is a front view corresponding to figure 11;

-figure 13 shows several retaining magnet shapes;

-figure 14 shows a damping or silencing component, mounted onto the key;

-figure 15 is a view analogous to that of figure 14;

-figure 16 depicts the portion of the assembly which encircles the key;

-figure 17 shows a supplementary damping or silencing component with the vibrating element attached to the case;

-figure 18 shows a modified version of that shown in figure 17;

-figure 19 depicts a supplementary damping or silencing component with a vibrating element mounted onto the key;

-figure 20 shows a fork-shaped vibrating element mounted onto a key

-figure 21 is a view corresponding to that of figure 20, but for the situation where the vibrating element is attached to the case.

Onto a key 1 suspended at the pivot point 2 and supported by the case 3 by means of a spring 4 is fixed a retaining device 6 into which the bar

shaped vibrating element 7 is attached. In the rest position, that is, when key 1 is in a horizontal position, the extremity of the vibrating element 7 rests on the retaining magnet 8. When the key 1 is pressed against the elastic stop 5, the vibrating element 7 bends until it is pulled away from the magnet 8 and begins to vibrate through the slot 10 of the deflector element or screen 9 and in front of the pole pieces 11 of the sound receiver 12.

As figure 2 shows, the sound receiver is made in the form of a closed box consisting of a part 13 containing a cover 14. Slots 10 allowing passage of the vibrating element are provided in the part 13.

In figure 4 the vibrating element is mounted onto the case 3 whereas the key carries the retaining magnet and the deflector element or screen. When the key is depressed the vibrating element 7 is bowwed upwards by the retaining magnet 16 which is fixed to the key 1 by a holding device 17. Simultaneously, the deflector comb 18, also fixed to the key 1 by a holding device 19, is displaced upwards. After being pulled away from the retaining magnet 16 the vibrating element 7 vibrates in front of the sound pick up 11,12, the deflector comb 18 then being above the vibrating element.

The deflector element 9, 18 is equipped with openings 10 allowing the passage of the vibrating element. In figure 6 a vibrating element for low notes is depicted. To the key 1 is fixed the spring-shaped vibrating element 21 equipped with a vibrating part 20 which is excited in the standard manner.

Figure 7 shows an arrangement with damper. The damper or silencing device 23 is mounted under the vibrating element 7 and connected to the case 3 by means of the spring 22. The damper presses against the vibrating element 7 when the latter is in its rest position, freeing it after break away from the retaining magnet occurs.

In figure 8, the vibrating element 7 is connected to a key 1, the free extremity of said vibrating element pressing against the retaining magnet 8. The box-shaped electromagnetic deflector element 24, within which the electromagnetic field 25 is placed off-axis, is fixed above the vibrating element 7. The deflector element or screen 24 is attached to an arm in the shape of a circular arc within which there is a slit 28. The deflector element 24 can freely turn within this slit 28. The supporting arm 27 is attached to the angle bracket 29. The latter contains a longitudinal slit 30 which makes it possible to adjust the height of the supporting arm 27 with respect to the vibrating element 7. The other end of the angle bracket rests upon the case 33. The latter has a longitudinal slit 34 within which the angle bracket, and with it the deflector element, can be displaced parallel to the long dimension of the vibrating element. As figure 9 shows, the portion of the angle bracket 29 attached to the case 33 contains a transverse slit 32 which

allows an adjustment of the deflector element 24 such that the vibrating element 7 can pass unhindered through slit 26. The angle bracket 29 is connected by means of a bolt 31 to the case 33.

The retaining magnet 8 of the vibrating element 7 is also height wise adjustable and mounted so as to be able to be displaced parallel to the long dimension of the vibrating element. For this purpose the retaining magnet 8 is mounted such as to be able to be displaced height wise inside the socket 35 which is fixed to the case 33 by a bolt 37 passing through a slit 36. In order that the vibrating element may rest upon the magnet at a point or along a line, the upper part of the retaining magnet 8 is constructed such as to provide a point or line-shaped surface. In figure 13 several retaining magnets 38, 39, 40, 41, and 42 having point or line-shaped surface are depicted.

As figure 14 and 15 indicate, a damping device consisting of an elastic spring 43 is provided on the key 1 next to the vibrating element 7. On the back end of the spring 43 is the damper 44 per se, made out of an elastic material which, with the key 1 in its rest position as shown in the drawings, presses against the under side of the key 1. When the key is depressed, the vibrating element 7, held fixed by the retaining magnet 8, bows. At this point the damper 44 follows the vibrating element 7 until it is held by the retaining device 45 attached to the case 33. When one continues to depress the key 1, the vibrating element 7 is pulled away from the retaining magnet 8 and begins to vibrate in the magnetic field 26 (figure 8). When the key is released so as to be able to return to its rest position, the damper 44 held by the retaining device 45 presses with a slowly increasing elastic force against the vibrating element and thus damps the vibrations without giving rise to disturbing noises. As figure 15 shows, the retaining device 44 and at the other end to the case 33.

Figure 16 depicts a closed element within which the key 1, the vibrating element 7, the retaining magnet 8, the deflector element or screen 24, and the field 2[illegible] are assembled on a common part of the case 33. The key 1 is mounted on tapered supports 47, 48. The supporting pin 47 is height wise adjustable as a result of a screen system 49 so that by this simple means the various juxtaposed elements surrounding a key can be brought to the same level. Next to the pins 47, 48 is mounted a retaining pin 50 which traverses a hole 54 inside the key and which is held inside the elastic guide on the upper part of the key. The head of the retaining pin 50 is equipped with a screw 51 carrying a spring 52 which forces the key 1, in its rest position, against an elastic stop 53. A pin 56 is fixed to the case 33 at the point where one activates the key 1. This pin 56 extends into a hole 57 provided in the key 1, guided on the under side by the elastic platelet 58. As a result of the upper and lower key guides, any displacement or lateral motion of the key becomes impossible. The elastic stop 59 for the key is attached to the case 33.

Figure 17 shows a key and a vibrating element which is fixed to the case 33, the vibrating element being put into vibration by a percussion device 60 attached to the key. Under the key 1 is a special damping key 61 which can be activated independently of the position of the key 1. At the extremity of the damping key 61 is a contact 62 which closes the circuit 63 containing the adjusting device 64 and thereby activates the electromagnet 65,66 which is mounted under the element 7 and damps the vibrations once the key 61 is depressed.

In figure 18, the key 67 serves as a damping key and has, at its extremity, a damper 68 which, when the key 67 is depressed opposes the force of the spring 69 and presses against the vibrating element 7, thereby damping the vibrations.

Figure 19 shows a key 1 with a vibrating element 7 and a retaining magnet 8. Damping key 67 with the damper 68 and the spring 69, all of which are activated in the same fashion as in figure 18, are mounted under the key 1.

In figure 20, the key 1 contains a fork-shaped vibrating element 70 which is activated by the percussion device 71 as affected by the retaining magnet 72 once the key is manipulated. In figure 21, the fork-shaped vibrating element 72 is attached to the case, whereas the key carries the percussion device 73 and damper 74.

CLAIMS

1. Stringless musical instrument with keyboard, equipped with an electrical sound producing system, characterized by each key being associated with an element capable of mechanically vibrating and tuned as a function of the sound to be produced, this element, upon manipulation of the key, being put into vibration within an electric or electromagnetic field serving to produce sounds.

2. Musical instrument according to claim 1, characterized by the vibrating element being of a bar made of magneticaaly conductive material, preferably a steel wire, said bar being firmly held at one extremity and exhibiting a length and thickness which correspond to the pitch of the particular sound to be produced.

3. Musical instrument according to claims 1 and 2, characterized by the freely vibrating extremity of the wire being maintained in a fixed position by a retaining device, for the key in its rest position, and by the release of the wire upon manipulation of the key once the wire has reached a predetermined tension necessary for the production of vibrations.

4. Musical instrument according to claims 1 to 3, characterized by a magnet of sufficient strength being used as a retaining device.

5. Musical instrument according to claim 4, characterized by the retaining magnet for the vibrating element being adjustable in the direction of the height and length of the vibrating element and by being constructed within its upper part, which faces the vibrating element, such that the vibrating element comes into contact with the retaining magnet at a point or on a line.

6. Musical instrument according to the claims 1 to 5, characterized by deflector element,or screen being provided between the sound producing field and the retaining device, this deflector element eliminating the secondary noises caused by the retaining device and upsetting sound production.

7. Musical instrument according to claim 6, characterized by the deflector element or screen being equipped with com-like cut-outs or openings permitting the vibrating element to pass through.

8. Musical instrument according to claims 6 and 7, characterized by the deflector element or screen being constructed in the shape of a cloud chamber within which the sound-producing fields are enclosed.

9. Musical instrument according to claims 6 to 8, characterized by several deflector elements or screens being provided one above the other in order to obtain an increase in the deflector effect.

10. Musical instrument according to claims 6 to 8, characterized by each key being associated with a closed box, serving as a deflector element or screen and equipped with a passthrough for the vibrating element, within which box the field serving to induce the sounds is arranged with respect to the vibrating element such that the vibrations of the vibrating element are produced transversally and, preferably, perpendicularly to the direction of the flux of the lines of force.

11. Musical instrument according to claims 10, characterized by the box which acts as deflector element or screen being constructed in the form of a circular box mounted so as to be able, by means of appropriate retaining devices, to be displaced heightwise, transversally and longitudinally with respect to the vibrating element.

12. Musical instrument according to claims 10 and 11, characterized by the field serving to produce sound being arranged of-axis within the deflector element and the latter being attached to the retaining device so as to allow motion in the peripheral direction.

13. Musical instrument according to claims 1 to 12, characterized by the vibrating elements being attached to the keys, whereas the retaining device and the deflector element or screen are attached to the instrument case.

14. Musical instrument according to claims 1 to 12, characterized by a retaining device and a deflector element being attached to each key, whereas the vibrating element is attached to the case.

15. Musical instrument according to claims 1 to 14, characterized by a damping device or muffler being provided in front of the retaining device, the damping device yielding to the movement of the vibrating elements and damping the vibrations of the latter.

16. Musical instrument according to claims 1 to 14, characterized by an elastic damping device which presses against the vibrating element when the latter is in its rest position and which is mounted on the key, this damping device being lifted off of the vibrating element by means of a retaining device attached to the case once the break-away position of the vibrating element is reached, resulting in an increasing pressure upon the vibrating element when the latter returns to its rest position.

17. Musical instrument according to claims 1 to 16, characterized by the key being mounted on a knife and held by a pin placed alongside the support, this pin going through the key and extending, elastically to the upper parts of the latter, the head of the retaining pin holding a spring which returns the key to its rest position.

18. Musical instrument according to claim 17, characterized by the supporting knife being arranged such that it can be heightwise displaced.

19. Musical instrument according to claims 17 and 18, characterized by a guide pin being provided within the case at the base of the key, this guide pin extending elastically to the undersite of the key.

20. Musical instrument according to claims 1 to 19, characterized by damping devices which are mechanically manipulatable, independently of the position of the key, for example by pressure, these devices allowing the vibrating elements to be damped individually or in groups during play.

21. Musical instrument according to claim 20 characterized, in the case where the vibrating elements are mounted onto the case, by an adjustable electromagnetic damping device is being provided, the circuit of this device being closed as a result of the manipulation of the damping key.

22. Musical instrument according to claim 1 characterized by the vibrating element being constructed in the shape of a tuning fork and put into vibration by an elastic percussion device activated by the key.

23. Musical instrument according to claim 22, characterized by the tuning fork-shaped vibrating element being attached either to the key or to the case.

24. Musical instrument according to claims 1 to 23, characterized by an elastic stop for the keys which allows the sound intensity to be modified.

25. Musical instrument according to claims 1 to 24, characterized, especially for producing lower notes, by the vibrating element being attached to the key through, preferably, and intervening spiral spring.

26. Musical instrument according to claims 1 to 25, characterized by the vibrating elements being arranged so as to be put into vibration by inertia once the keys are manipulated.

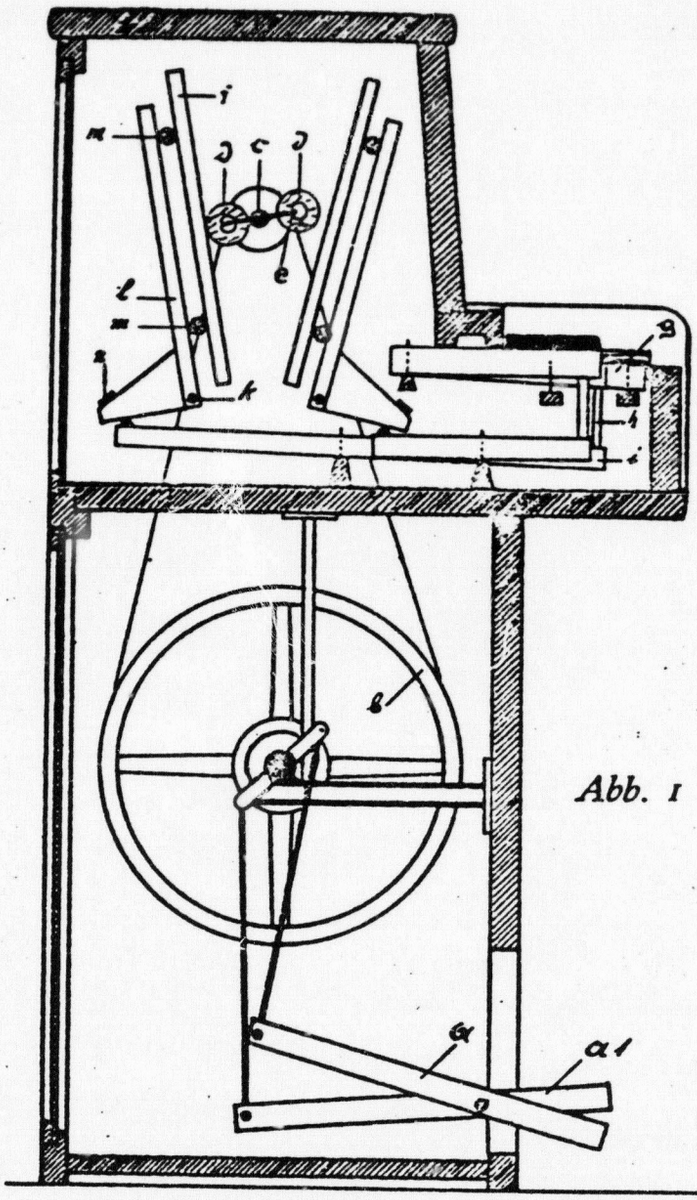
27. Musical instrument according to claims 1 to 26, characterized by each key, along with the associated devices and components which serve for sound production, being a closed and independent structure.

P. PON. K. BASSLER.

Agent : A. VANDER HAEGHEN

Attached: 3 drawings.

Zu der Patentschrift 567 657
Kl. 51 b Gr. 40



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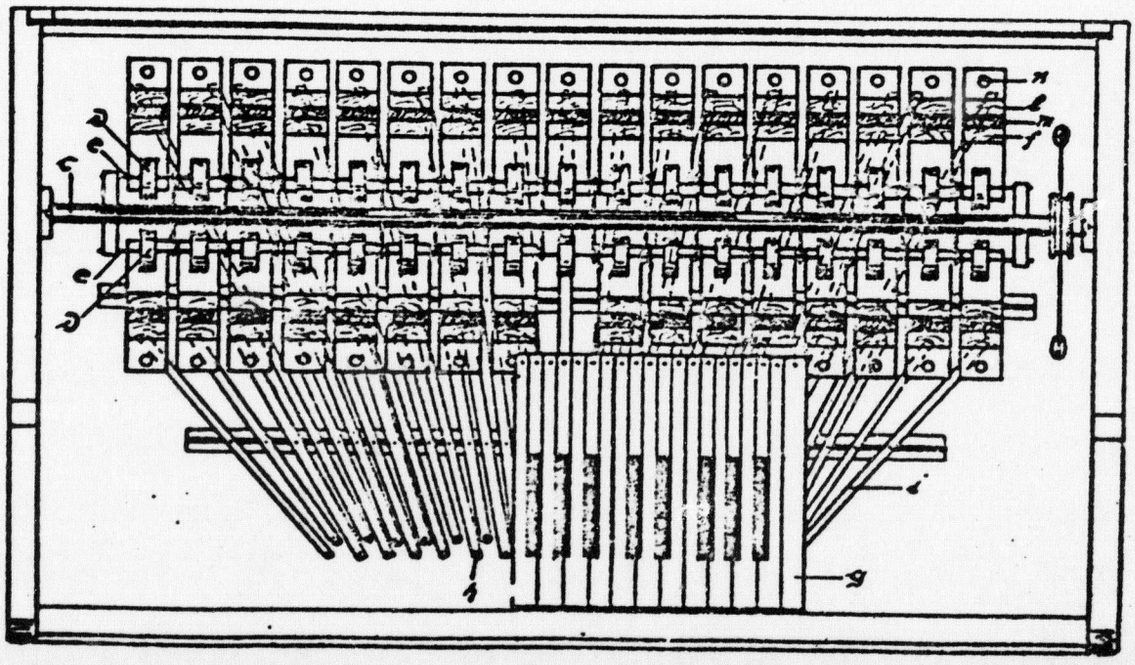

SPECIAL VERDICT

I. Do you find that defendants in the construction of their designated toy musical instruments are employing only the prior art, plus variations that would have been obvious at the time of the patented invention to persons having ordinary skill in the art? (Answer "Yes" or "No" as to each):

Big Mouth Singers	(Exhibit 4)	NO
Melody Bell-O-Phone	(Exhibit 5)	NO
Melody Bell-O-Phone	(Exhibit 5A)	NO

(If the answer to any part of Question I is "Yes," the corresponding part of Question II need not be answered.)

II. Please indicate below whether you find in the designated toy musical instruments means which perform the same function in substantially the same way to accomplish substantially the same result as the elements of the patent claims listed below:

	Defendant's Instruments (Answer "Yes" or "No" for each)		
	Big Mouth Singers (Exhibit 4)	Melody Bell-O-Phone (Exhibit 5)	Melody Bell-O-Phone (Exhibit 5A)
1. an elongated slot in the front side of the housing,	YES	YES	YES
2. a key support ledge projecting parallel to the elongated slot,	YES	YES	YES
3. a plurality of projections capable of serving as fulcrums (pivots) mounted on the housing to project upwardly from the lower edge of the slot,	YES	YES	YES
4. keys having recesses located in the bottoms thereof with each said recess receiving one of said projections and supporting said keys for rotation about said projections, and	YES	YES	YES
5. said keys being capable of being engaged on the outside of said housing so as to be pushed into engagement with said key support ledge so as to rotate said keys about said projections to a playing position.	YES	YES	YES

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